No. 8245

JVC Service Manual

COMPACT VIDEO CASSETTE RECORDER

MODEL HR-C3U

BATTERY CHARGER

MODEL BB-P3U

AC POWER PACK

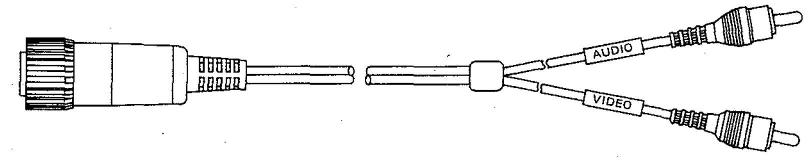
MODEL AC-P3U

CAR BATTERY ADAPTER

MODEL AP-P3U

VICTOR COMPANY OF JAPAN, LIMITED

VC-P31U A/V Recording Cable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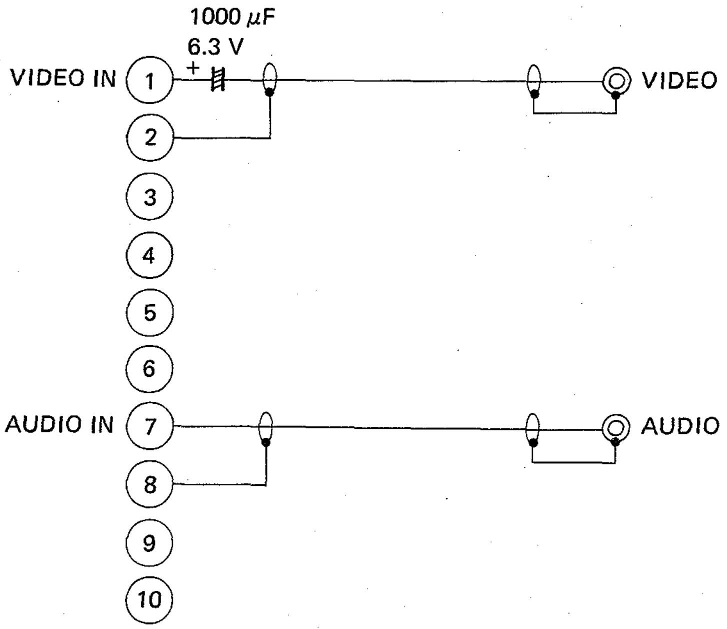
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AUDIO IN
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VIDEO
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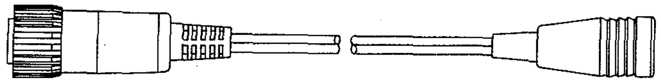
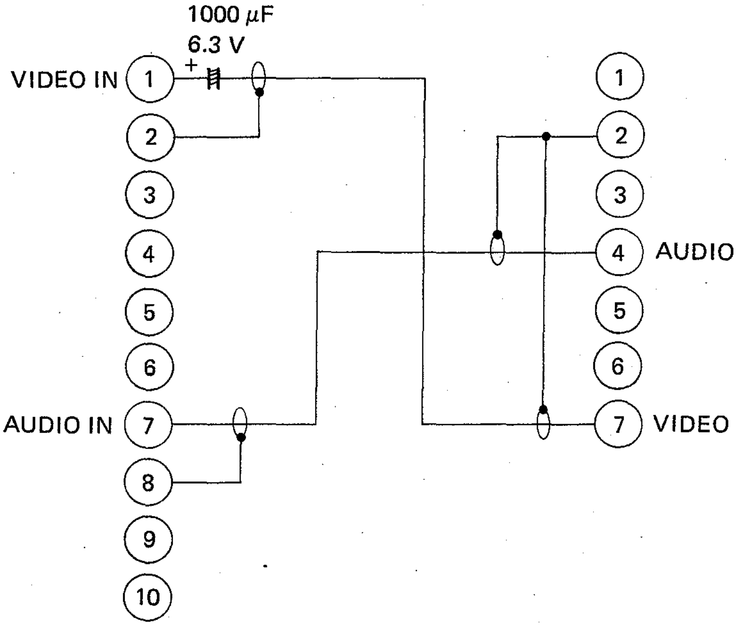
VC-P32U Tuner Cable

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AUDIO
5
6
7
VIDEO

No. 8245 (1/4)

JVC Service Manual

PAUSE
PLAY
REC
STOP
REW
FF
AUDIO DUB
DEW
BATTERY
RESET
MEMORY COUNTER
REMAINING
POWER
JVC

MODEL HR-C3U

JVC COMPANY OF AMERICA

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Important Safety Precautions

Prior to shipment from the factory, JVC products are strictly inspected to conform with the recognized product safety and electrical codes of the countries in which they are to be sold. However, in order to maintain such compliance, it is equally important to implement the following precautions when a set is being serviced.

● Precautions during Servicing

1. Locations requiring special caution are denoted by labels and inscriptions on the cabinet, chassis and certain parts of the product. When performing service, be sure to read and comply with these and other cautionary notices appearing in the operation and service manuals.

2. Parts identified by the ⚠ symbol and shaded (▨) parts are critical for safety.
   Replace only with specified part numbers.
   Note: Parts in this category also include those specified to comply with X-ray emission standards for products using cathode ray tubes and those specified for compliance with various regulations regarding spurious radiation emission.

3. Use specified internal wiring. Note especially:
   1) Wires covered with PVC tubing
   2) Double insulated wires
   3) High voltage leads

4. Use specified insulating materials for hazardous live parts. Note especially:
   1) Insulation Tape
   2) PVC tubing
   3) Spacers
   4) Insulation sheets for transistors

5. When replacing AC primary side components (transformers, power cords, noise blocking capacitors, etc.) wrap ends of wires securely about the terminals before soldering.

6. Observe that wires do not contact heat producing parts (heatsinks, oxide metal film resistors, fusible resistors, etc.)

7. Check that replaced wires do not contact sharp edged or pointed parts.

8. When a power cord has been replaced, check that 10–15 kg of force in any direction will not loosen it.

9. Also check areas surrounding repaired locations.

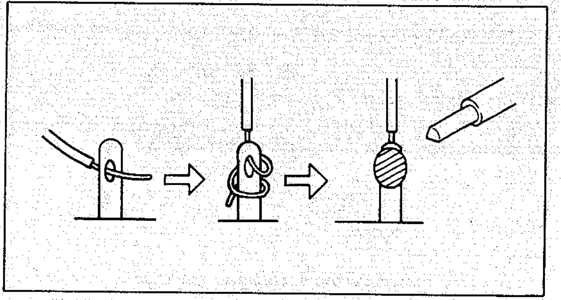


Fig. 1

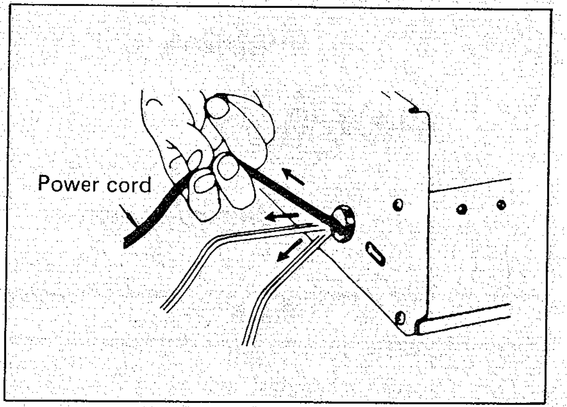


Fig. 2

10. Products using cathode ray tubes (CRTs)
    In regard to such products, the cathode ray tubes themselves, the high voltage circuits, and related circuits are specified for compliance with recognized codes pertaining to X-ray emission. Consequently, when servicing these products, replace the cathode ray tubes and other parts with only the parts specified. Under no circumstances attempt to modify these circuits. Unauthorized modification can increase the high voltage value and cause X-ray emission from the cathode ray tube.

11. Crimp type wire connector

In such cases as when replacing the power transformer in sets where the connections between the power cord and power transformer primary lead wires are performed using crimp type connectors, if replacing the connectors is unavoidable, in order to prevent safety hazards, perform carefully and precisely according to the following steps.

1. Connector part number : E03830-001
2. Required tool : Connector crimping tool of the proper type which will not damage insulated parts.
3. Replacement procedure
   1) Remove the old connector by cutting the wires at a point close to the connector.
   Important : Do not reuse a connector (discard it).
   2) Strip about 15 mm of the insulation from the ends of the wires. If the wires are stranded, twist the strands to avoid frayed conductors.
   3) Align the lengths of the wires to be connected. Insert the wires fully into the connector.
   4) As shown in Fig. 6, use the crimping tool to crimp the metal sleeve at the center position. Be sure to crimp fully to the complete closure of the tool.
   5) Check the four points noted in Fig. 7.

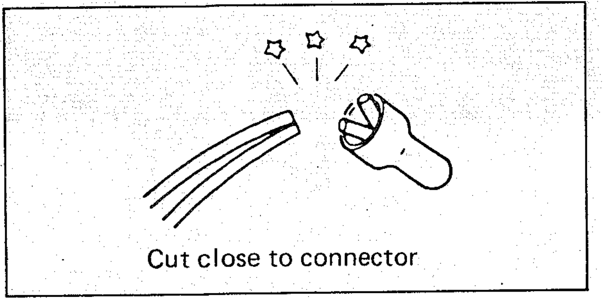

Cut close to connector

Fig. 3

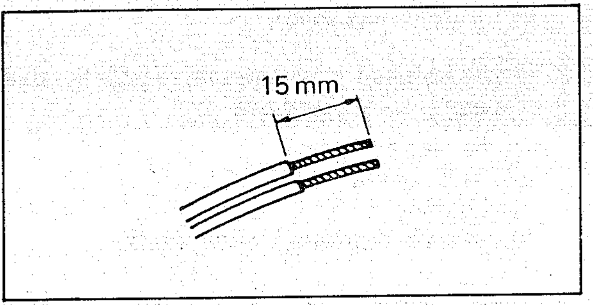


Fig. 4

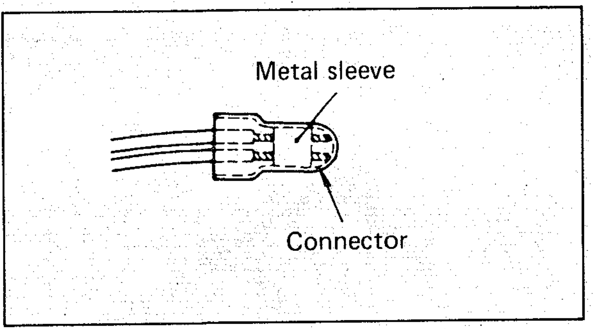

Metal sleeve
Connector

Fig. 5

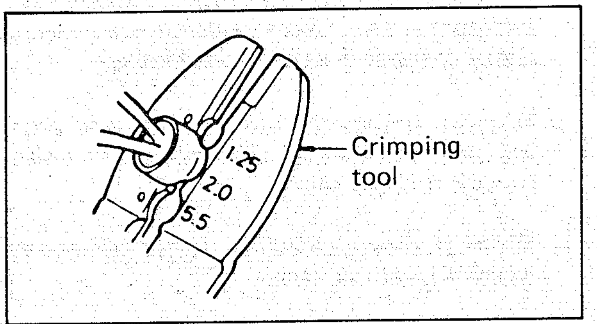

1.25
2.0
5.5
Crimping tool

Fig. 6

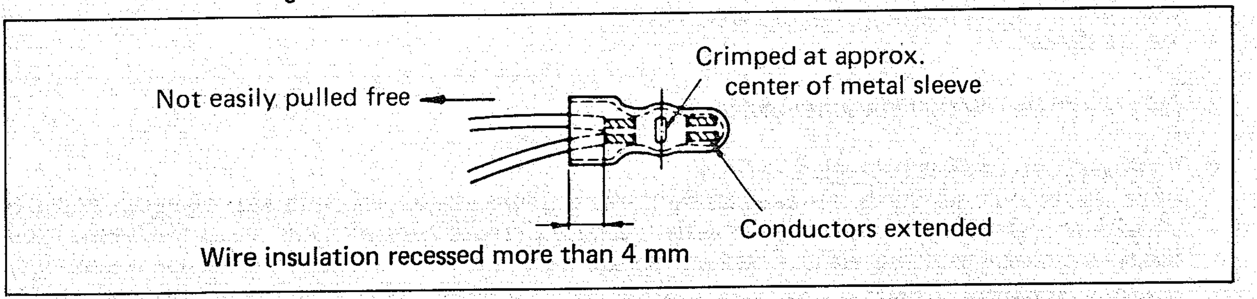

Crimped at approx. center of metal sleeve
Not easily pulled free
Conductors extended
Wire insulation recessed more than 4 mm

Fig. 7

● Safety Check after Servicing

Examine the area surrounding the repaired location for damage or deterioration. Observe that screws, parts and wires have been returned to original positions. Afterwards, perform the following tests and confirm the specified values in order to verify compliance with safety standards.

1. **Insulation resistance test**
   Confirm the specified insulation resistance or greater between power cord plug prongs and externally exposed parts of the set (RF terminals, antenna terminals, video and audio input and output terminals, microphone jacks, earphone jacks, etc.). See table below.

2. **Dielectric strength test**
   Confirm specified dielectric strength or greater between power cord plug prongs and exposed accessible parts of the set (RF terminals, antenna terminals, video and audio input and output terminals, microphone jacks, earphone jacks, etc.) See table below.

3. **Clearance distance**
   When replacing primary circuit components, confirm specified clearance distance (d),(d') between soldered terminals, and between terminals and surrounding metallic parts. See table below.

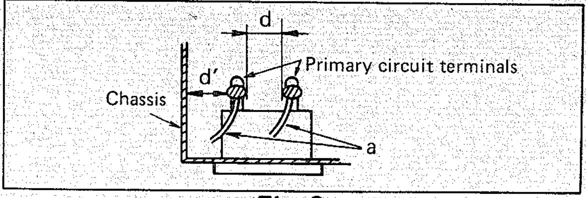


Fig. 8

Table 1: Ratings for selected areas

AC Line Voltage	Region	Insulation Resistance	Dielectric Strength	Clearance Distance(d),(d')
100 V	Japan	≧ 1 MΩ/500 V DC	1 kV 1 minute	≧ 3 mm
110 to 130 V	USA & Canada	– – –	900 V 1 minute	≧ 3.2 mm
* 110 to 130 V 200 to 240 V	Europe Australia	≧ 10 MΩ/500 V DC	4 kV 1 minute	≧ 6 mm (d) ≧ 8 mm (d') (a: Power cord)

* Class II model only.

Note. This table is unofficial and for reference only. Be sure to confirm the precise values for your particular country and locality.

4. **Leakage current test**
   Confirm specified or lower leakage current between B(earth ground, power cord plug prongs) and externally exposed accessible parts (RF terminals, antenna terminals, video and audio input and output terminals, microphone jacks, earphone jacks, etc.).

   Measuring Method: (Power ON)
   Insert load Z between B(earth ground, power cord plug prongs) and exposed accessible parts. Use an AC voltmeter to measure across both terminals of load Z. See figure and following table.

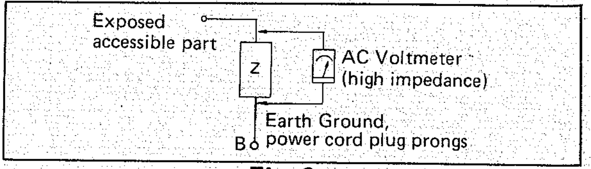

Exposed accessible part
Z
AC Voltmeter (high impedance)
Earth Ground, power cord plug prongs
B

Fig. 9

Table 2: Leakage current ratings for selected areas

AC Line Voltage	Region	Load Z	Leakage Current (i)	Earth Ground (B) to:
100 V	Japan	1 kΩ	i ≦ 1m A rms	Exposed accessible parts
110 to 130 V	USA & Canada	0.15 µF 1.5 kΩ	i ≦ 0.5m A rms	Exposed accessible parts
110 to 130 V 200 to 240 V	Europe Australia	2 kΩ	i ≦ 0.7 m A peak i ≦ 2 m A dc	Antenna earth terminals
		50 kΩ	i ≦ 0.7 m A peak i ≦ 2 m A dc	Other terminals

Note. This table is unofficial and for reference only. Be sure to confirm the precise values for your particular country and locality.

HR-C3U

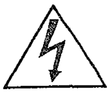
INSTRUCTIONS

For reference, the text of the instruction booklet of this model is reproduced in the following pages.
Numbering of the pages also corresponds with that of the booklet.

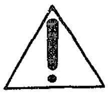
CAUTION

RISK OF ELECTRIC SHOCK
DO NOT OPEN

CAUTION: TO REDUCE THE RISK OF ELECTRIC SHOCK,
DO NOT REMOVE COVER (OR BACK).
NO USER-SERVICEABLE PARTS INSIDE.
REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.



The lightning flash with arrowhead symbol, within an equilateral triangle, is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.



The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

VHSC

This compact video cassette recorder is designed exclusively for the VHSC video cassette. Only cassettes marked VHSC can be used with this recorder.

WARNING:
TO PREVENT FIRE OR SHOCK HAZARD, DO NOT EXPOSE THIS UNIT TO RAIN OR MOISTURE.

This unit should be used with 12 V DC only.
CAUTION:
To prevent electric shocks and fire hazards, do NOT use any other power source.

Warning to purchasers:
One Federal Court has held that in-home use of videotape recorders for off-air recording of copyrighted television programming is copyright infringement.

NOTE:
The rating plate (serial number plate) is on the bottom of the unit.

JVC Company of America
41 Slater Drive, Elmwood Park, New Jersey 07407

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Printed in Japan

Thank you for purchasing the JVC **HR-C3**, a VHS recorder that is truly portable. The **HR-C3** is specially designed for use in combination with a video camera and can be connected directly to a television receiver for playback. Because the **HR-C3** is compatible with other VHS machines, the VHS-C tapes recorded by the **HR-C3** can be played back with a regular VHS machine using a cassette adapter or conveniently be dubbed to standard VHS tapes for home viewing. Because of its light weight and compact size, we are sure that you will find the **HR-C3** ideal for use wherever you go and that it will help you add variety to your video programming.

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  Playback 6
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FEATURES

Recording/Playback
Up to 20 minutes of fully VHS-compatible recording and playback is possible with a single VHS compact video cassette.

RF converter
With its built-in RF converter that can be tuned to either channel 3 or 4, the **HR-C3** can be connected directly to the antenna terminal of a TV set, for playback of recorded material.

Automatic backspace editing
When the camera's stop button is pressed during recording, the tape is automatically backspaced slightly. When recording is resumed, the video signal of the continuing sequence is recorded exactly at the point where the previous section was stopped. This all but eliminates picture distortion between the two recorded sequences.

Automatic quick review function
When the tape is being backspaced, if the camera has an electronic viewfinder or if the **HR-C3** is connected to a video monitor, the last second of the recording will be seen in reverse. This allows you to check that satisfactory recording was made.

Standby mode lock
With the convenient recording standby mode lock, even when the power is switched off between separately recorded sequences, the new sequence is synchronized with the previously recorded sequence so that virtually no distracting picture distortion results when recording resumes.

Audio dubbing
The audio dubbing facility makes recording a new soundtrack possible – narration from a microphone, for example – onto an already recorded program.

Two-way shuttle search
So that any recorded sequence can be located quickly, the tape can be fast forwarded or rewound at three times normal speed with the picture visible on a TV screen or in the camera's electronic viewfinder.

Full-function remote control
The full-function remote control gives control over all tape functions including shuttle search and audio dubbing as well as power on/off from a distance.

Switchable LCD counter
This low power-consuming tape counter has a memory function for quick location of a predetermined point on the tape and can be switched to show the remaining time left for recording.

Flexible power supply
An ingenious power supply system is employed; the power supply units slide onto the rear panel of the **HR-C3** and click into position. The standard battery pack has a capacity of 0.7 AH, enough to power the **HR-C3** and a video camera for 30 minutes. An exclusive battery charger is provided to charge this battery pack (in approx. 60 min.) and the optional 50-minute 1.2 AH high-capacity battery pack (in approx. 90 min.). Two other power supply units are available; the AC power pack and the car battery adapter.

PRECAUTIONS

Handling and storage

- Prevent inflammables, water and metallic objects from entering the unit.
- Do not disassemble or modify the unit, as this will cause danger and malfunctioning.
- Do not use the unit when there is lightning in the vicinity and exercise special care not to allow the unit to become wet when shooting outdoors on rainy days.
- Do not place heavy objects on the unit.
- Do not subject the unit to vibrations or shocks.
- Do not subject the unit to direct sunlight or place it near a heater for a long period of time, otherwise the cabinet may become deformed or the internal electronic components such as transistors may be damaged. Pay special attention to rising temperature in closed cars on hot summer days; the temperature in closed cars sometimes reaches as high as 80°C (176°F).
- Avoid using the unit under the following conditions:
  - Extremely hot or cold places
  - Near appliances generating strong magnetic fields
  - Moving from a cold to a warm place
  - Places subject to excessive humidity, dust or vibrations.

Moisture condensation

You have observed that pouring a cold liquid into a glass will cause drops of water to form on the glass's outer surface. This same phenomenon occurs on the head drum of a video recorder when the recorder is moved from a warm place to a cool place. Moisture on the head drum can cause severe damage to the video tape, and can lead to internal damage to the recorder itself. If moisture condensation occurs on the head drum, the DEW indicator lights. In such a case, be especially careful to allow sufficient time for it to dry before operating the machine. See page 16.

Maintenance

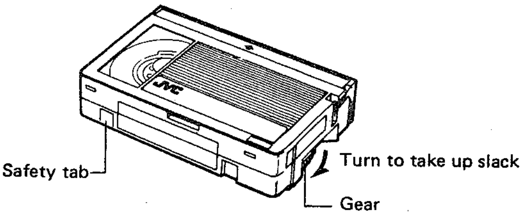
- When the cabinet is dusty, clean by gently wiping with a soft cloth.
- Avoid the use of strong cleaning agents such as benzine or alcohol as they may damage the cabinet.

Serious malfunctioning

> If malfunctioning occurs, stop using the unit immediately and consult your local JVC Service Center. Call (1)800-447-4700 for centers near you.

Video cassettes

- The **HR-C3** employs compact video cassettes carrying the VHS C mark only.
- Recording onto prerecorded tapes automatically erases the previously recorded video and audio signals.
- An inverted cassette cannot be inserted.
- Do not load and unload the cassette repeatedly without allowing the tape to run at all. This will slacken the tape and thereby damage it.
- Make certain before loading the cassette that the tape is not slackened. If there is any slack, turn the gear on the cassette in the direction of the arrow to take up slack.
- The cassette is equipped with a safety tab to prevent accidental erasure. When the tab is removed, recording is impossible. If you wish to record on a cassette whose tab has been removed, use adhesive tape to reseal the slot.
- To avoid excessive exposure to dust and fingerprints, do not open the front tape cover except when necessary.

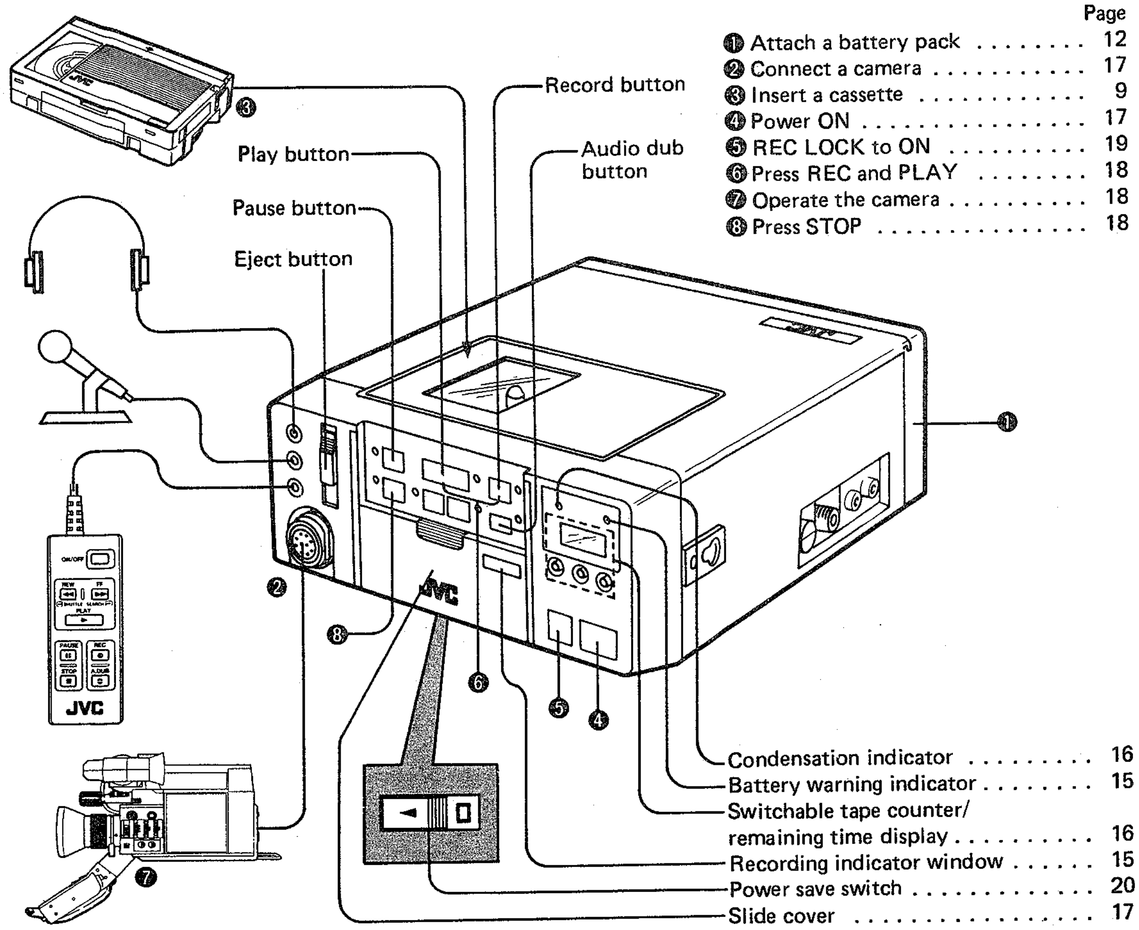


Storage of cassettes

- Avoid exposing the cassettes to direct sunlight. Keep them away from heaters.
- Avoid storing the cassettes in humid or dusty places.
- Do not drop the cassettes. Do not expose them to violent vibrations or shocks.
- Do not expose the cassettes to strong magnetic fields (near a motor, transformer or magnet).
- Place the cassettes in cassette cases and position them vertically.

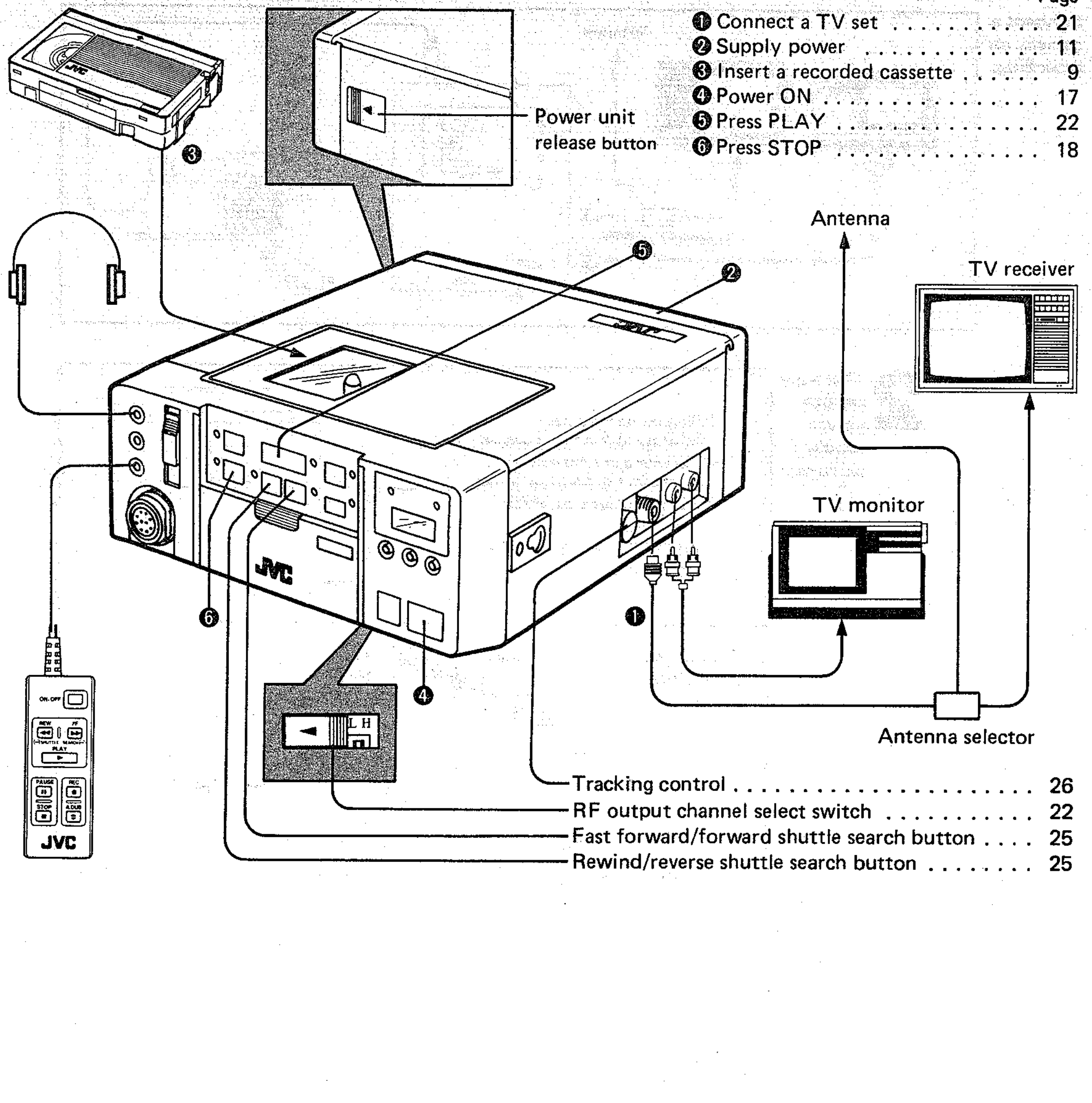
BASIC OPERATION PROCEDURE – RECORDING WITH A CAMERA

	Page
❶ Attach a battery pack	12
❷ Connect a camera	17
❸ Insert a cassette	9
❹ Power ON	17
❺ REC LOCK to ON	19
❻ Press REC and PLAY	18
❼ Operate the camera	18
❽ Press STOP	18


❸
Play button
Pause button
Eject button
Record button
Audio dub button
❶
❷
❽
❻
❺
❹
❼
JVC
ON/OFF
REW
FF
SHUTTLE SEARCH
PLAY
PAUSE
REC
STOP
A.DUB
Condensation indicator 16
Battery warning indicator 15
Switchable tape counter/ remaining time display 16
Recording indicator window 15
Power save switch 20
Slide cover 17

BASIC OPERATION PROCEDURE – PLAYBACK

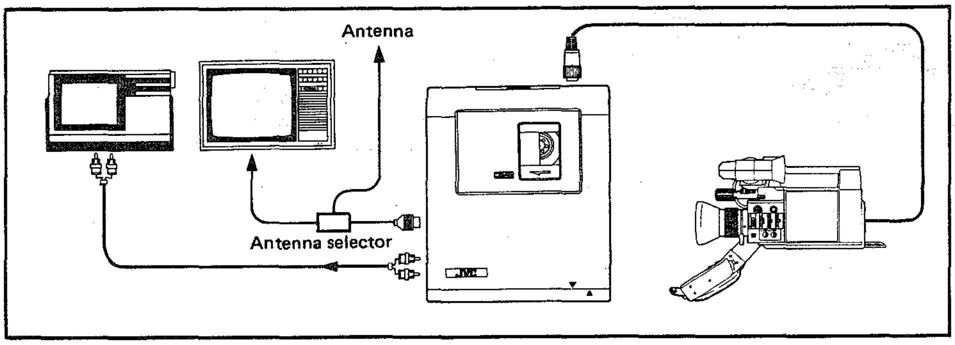
	Page
❶ Connect a TV set	21
❷ Supply power	11
❸ Insert a recorded cassette	9
❹ Power ON	17
❺ Press PLAY	22
❻ Press STOP	18


Power unit release button
Antenna
TV receiver
TV monitor
Antenna selector
❶
❷
❸
❹
❺
❻
L H
JVC

Tracking control	26
RF output channel select switch	22
Fast forward/forward shuttle search button	25
Rewind/reverse shuttle search button	25

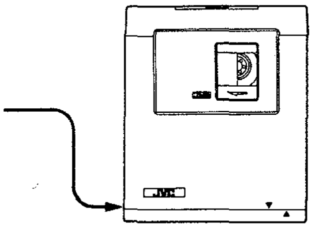
WAYS THE HR-C3 CAN BE USED

1 Connect a camera for recording.

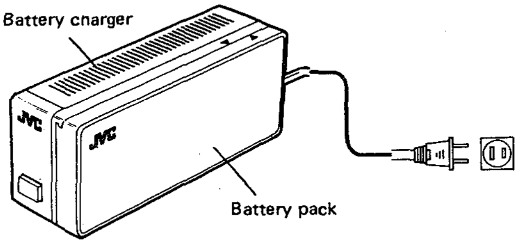

Antenna
Antenna selector

2 There are various power supply options.

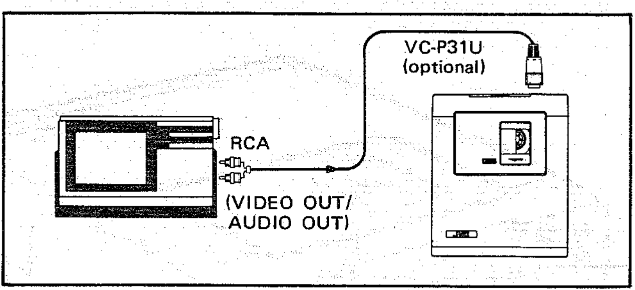
- Regular battery pack NB-P3U (0.7 AH) (standard)
- High-capacity battery pack NB-P4U (1.2 AH) (optional)
- AC power pack AC-P3U (optional)
- Car battery adapter AP-P3U (optional)



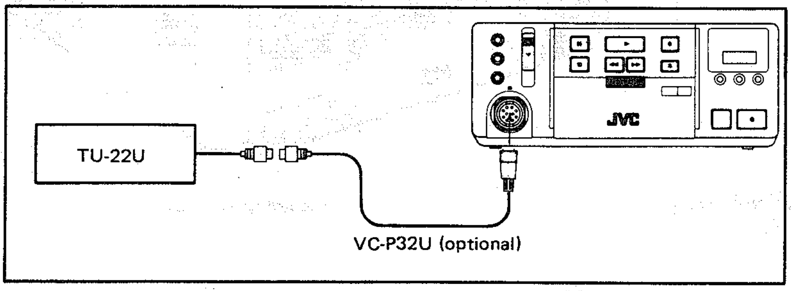
Recharging the battery pack.


Battery charger
Battery pack

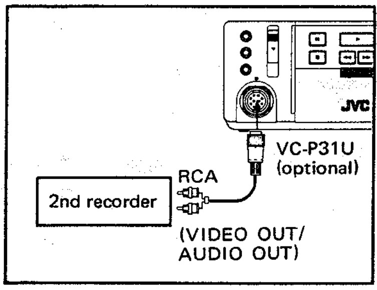
3 Recording from a TV monitor.


VC-P31U
(optional)
RCA
(VIDEO OUT/
AUDIO OUT)

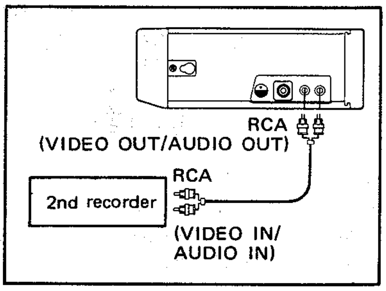
4 Recording from a tuner.


TU-22U
VC-P32U (optional)
JVC

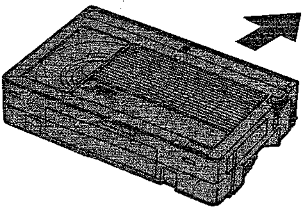
5 Tape dubbing from another video recorder.


JVC
VC-P31U
(optional)
RCA
2nd recorder
(VIDEO OUT/
AUDIO OUT)

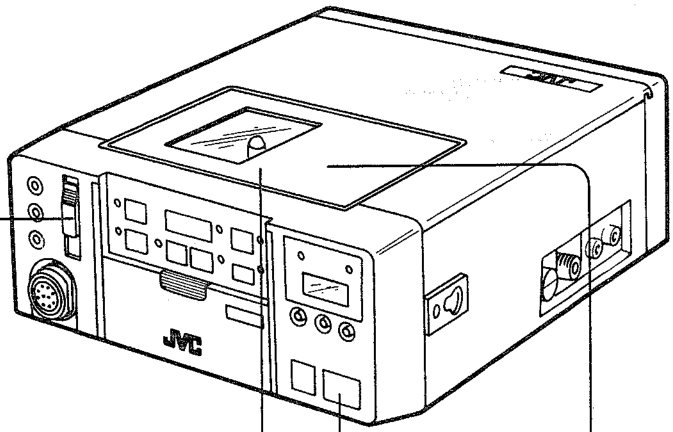
6 Tape dubbing onto another video recorder.


RCA
(VIDEO OUT/AUDIO OUT)
RCA
2nd recorder
(VIDEO IN/
AUDIO IN)

LOADING A VIDEO CASSETTE

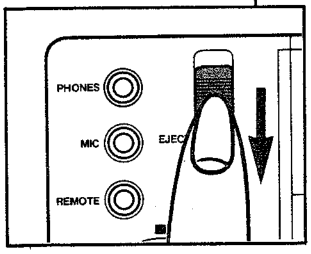


Insert the cassette with its printed arrow upward.


POWER button

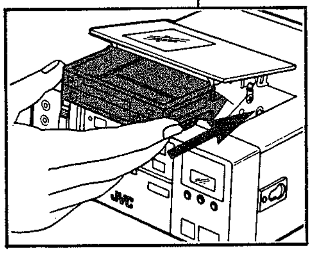
If the EJECT button will not slide down, first switch on the power.

1


PHONES
MIC
EJEC
REMOTE

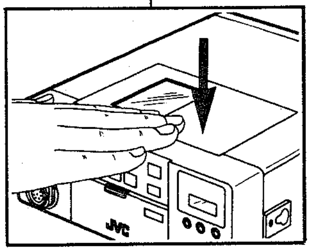
Open the cassette holder by sliding the EJECT button down.

2



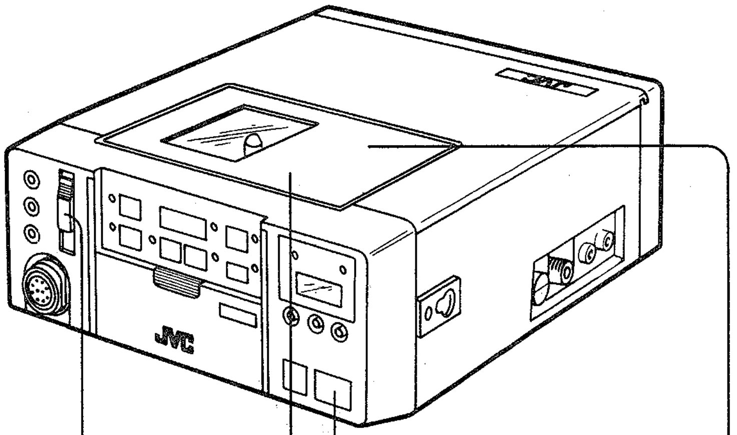
Insert the cassette.

3



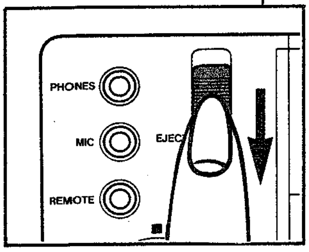
Close the cassette holder.

REMOVING A VIDEO CASSETTE


POWER button

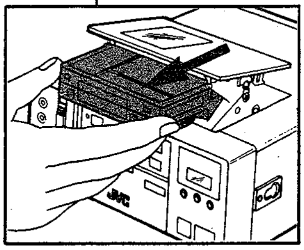
Make sure the recorder is in the Stop mode and the REC LOCK switch is OFF.

1


PHONES
MIC
EJEC
REMOTE

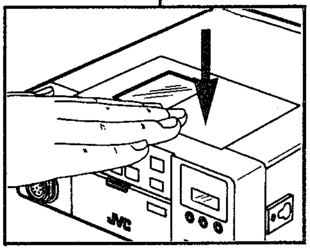
Slide the EJECT button down.

2



Remove the cassette.

3



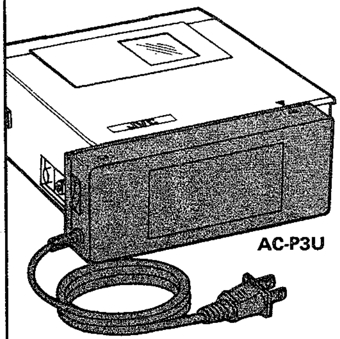
Close the cassette holder.

POWER SUPPLY SYSTEM

The convenient 3-way power supply system gives you a choice of the most appropriate power supply unit, depending on the application.

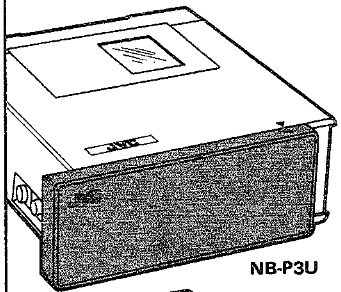
With AC power

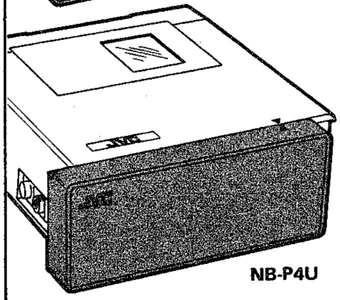
Use the optional AC-P3U AC power pack.


AC-P3U
To AC outlet

Where AC power is not available

Use the NB-P3U battery pack provided or the optional NB-P4U high-capacity battery pack.

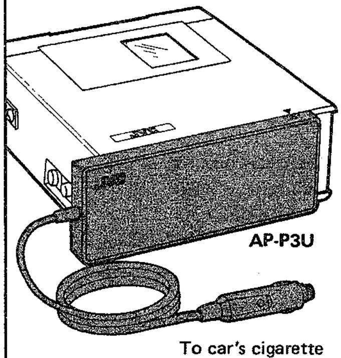




● Recharging procedure on page 13.

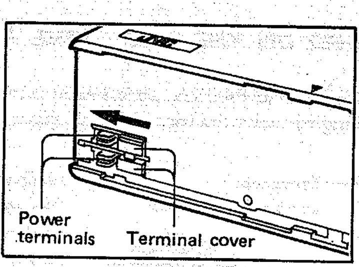
In a car

Use the optional AP-P3U car battery adapter.


AP-P3U
To car's cigarette lighter socket

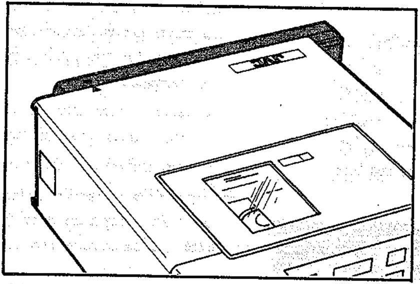
ATTACHING & REMOVING POWER SUPPLY UNITS

- The method of attachment and removal is identical for all power supply units.
- Be sure to switch off all power switches before attachment or removal.
- Check to see if the power terminals on the rear of the unit are covered with the terminal cover. If not, slide the terminal cover in the direction of the arrow.



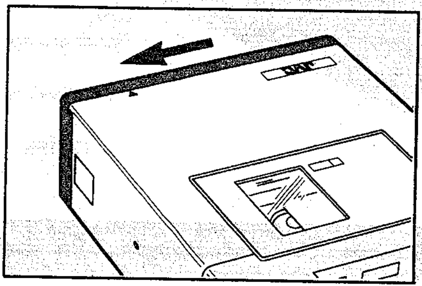
To attach

1



Align the marks.

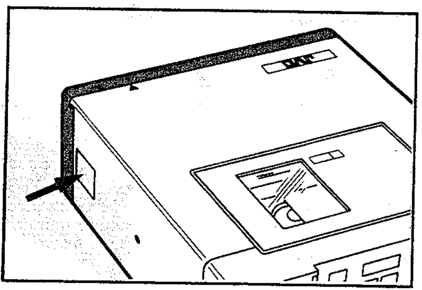
2



Slide until the unit locks in place.

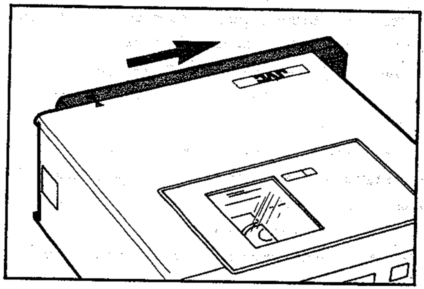
To remove

1



While pressing the release button . . .

2

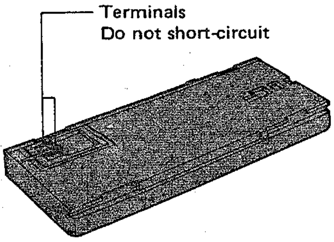


. . . slide off.

CHARGING THE BATTERY PACK

A WORD ON THE EXCLUSIVE NB-P3U/NB-P4U BATTERY PACKS

The NB-P3U/NB-P4U are nickel-cadmium batteries. Give attention to the following to make the most of their characteristics.



Temperature ranges:
The recharging time is based on room temperature of 20°C (68°F) with a power supply of 120 V. The lower the temperature, the longer the recharging time.

For charging:	10°C to 35°C (50°F – 95°F)
For operating:	-10°C to 40°C (14°F – 104°F)
For storing:	-10°C to 30°C (14°F – 86°F)

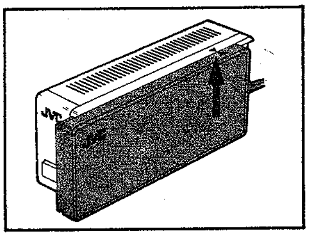
For safety, the battery pack has been kept in the uncharged state for shipment. Therefore, before use, charge it.

- **Avoid repeated charging.**
  Charging the battery pack repeatedly without using it may cause over-charging and shorten its service life.
- **Recharge using only a specified charger at 10°C to 35°C (50°F to 95°F).**
  Especially avoid recharging in a place under 10°C (50°F), as it may cause over-charging.
- **After use, store in a discharged condition.**
- **Do not store in places of high temperatures.**
  Choose a dry place with temperatures between -10°C (14°F) and 30°C (86°F) for optimum storage.
- **The battery pack becomes warm immediately after being charged. This is not due to any defect.**

Caution
The terminals are exposed on the bottom of the battery pack. DO NOT short-circuit these terminals.

- If they are shorted, a great amount of current flows. This is not only very dangerous, but also makes the battery pack unusable.
- When transporting or storing the battery pack, exercise special care so that no metallic object touches the terminals.
- Always keep the terminals clean. If they become dirty, wipe them with a piece of soft cloth.
- The fully charged NB-P3U battery pack provides power to the HR-C3 and a video camera (whose power consumption is about 6 watts) for about 30 minutes of continuous recording; the NB-P4U, for about 50 minutes.

1



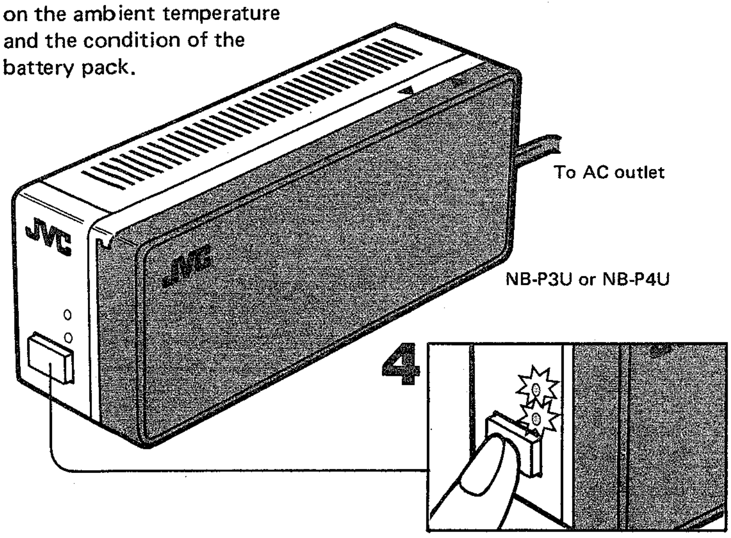
Align the marks.

Use the BB-P3U battery charger (provided). Charging time is about 60 minutes for a regular battery pack and 90 minutes for a high-capacity battery pack.

- The charging time differs depending on the ambient temperature and the condition of the battery pack.

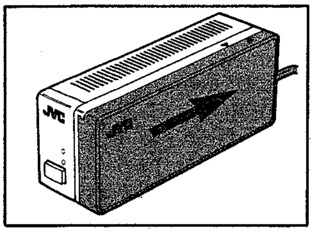
Note:

- If the terminals on the charger are exposed, attaching the battery pack is impossible. Move the cover over the terminals by hand.



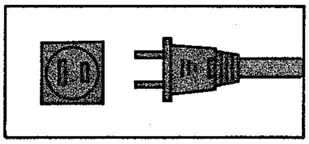
Press the POWER button. The POWER indicator will light first and the CHARGE indicator will light in a few seconds.

2



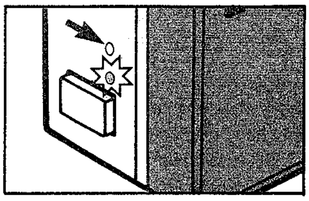
Slide until it locks in place.

3



Connect to a wall outlet.

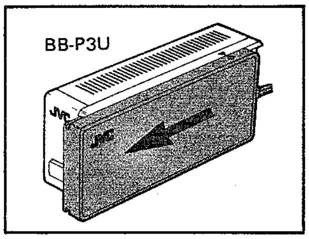
5



When charging is completed, the CHARGE indicator goes out.

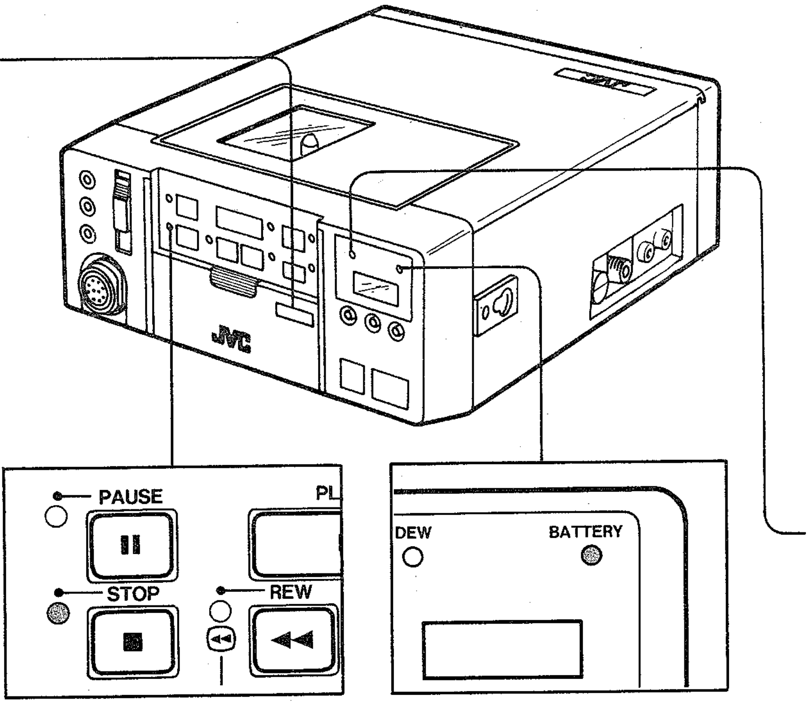
- If the POWER button is left in its ON position after the CHARGE indicator goes out, additional charging continues with a small amount of current.

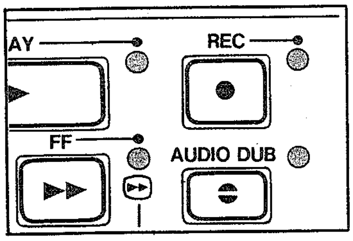
6



Remove the battery pack by sliding it off.

INDICATORS



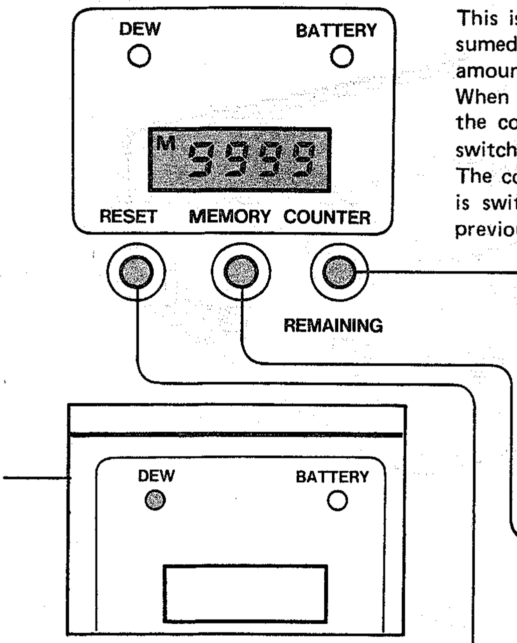


Tape mode indicators
LED indicators are provided by each of the operation buttons so that you can see the operating mode at a glance.
The recording indicator doubles as a tape running indicator in the recording mode; it lights continuously in the recording standby mode and flickers when the tape is running.
A recording indicator window is provided on the front panel slide cover for checking the recording mode with all the tape control buttons covered.

Emergency mode indicator
When the recorder fails to function properly, the STOP indicator flickers and the power will be switched off automatically after a short while. In such a case, press the POWER button to OFF and press it again to ON after a few seconds.

Battery warning indicator
This LED lights when there is insufficient battery power for normal operation, warning you that you should replace or recharge the battery pack. If you continue operating the recorder in this condition, the power will be switched off automatically.

Tape counter/Remaining time display



This is normally a 4-digit tape counter showing the amount of tape consumed. When the REMAINING button is pressed, the display shows the amount of tape left in minutes and seconds.

When power is switched off with the counter in the Remaining Time mode, the counter enters the Tape Counter mode automatically when power is switched on again.

The counter reading is held in memory for about one hour after the power is switched off; if you switch power on again within this period, the previous counter reading will be displayed.

REMAINING button

When this button is pressed, the counter enters the Remaining Time mode and displays the approximate amount of tape remaining in terms of time.

More than 5 minutes remaining: Only minutes are displayed; 7:00, 6:00, 5:00, etc.

Less than 5 minutes remaining: Minutes and seconds are displayed; 4:59, 4:58, 4:57, etc.

To switch to the Tape Counter mode, press this button once again.

MEMORY button

With this button pressed, the tape stops automatically when the counter reads around "0000" in the Rewind and Fast Forward modes. This is convenient when you want to locate a particular point on the tape. For more details, refer to page 25. When the MEMORY button is pressed, "M" appears in the tape counter display.

RESET button

To reset the tape counter to "0000".

Dew indicator

This LED lights when there is condensation on the head drum; when it lights, the recorder cannot be used. If this dew warning lights when you have switched on the recorder, you must turn off the unit and wait for a few hours until the indicator no longer flashes when power is applied.

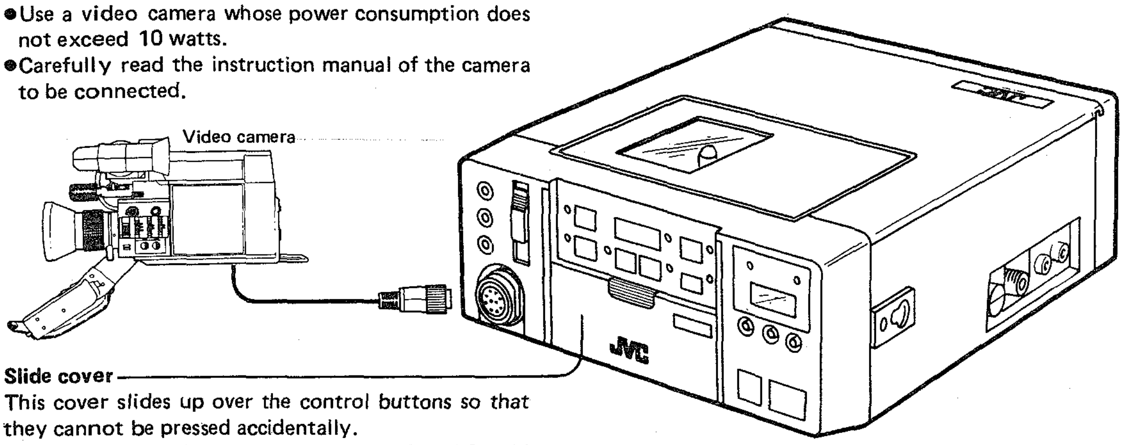
Notes

- The remaining time display does not function during fast forward or rewind.
- The remaining time indicator will present this display --:-- for about 10 seconds while it evaluates the amount of tape remaining.

RECORDING WITH A CAMERA

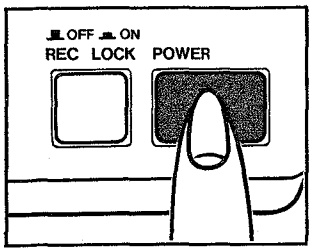
Connection

- Connect a video camera using a 10-pin cable.
- Use a video camera whose power consumption does not exceed 10 watts.
- Carefully read the instruction manual of the camera to be connected.


Video camera
JVC

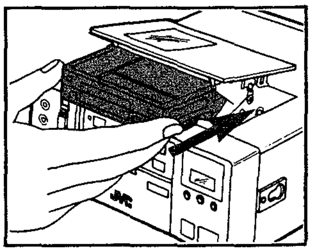
Slide cover
This cover slides up over the control buttons so that they cannot be pressed accidentally.
Slide it up after having pressed the REC and PLAY buttons.

1


OFF ON
REC LOCK
POWER

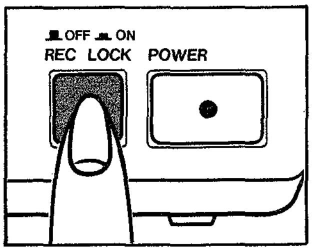
Press the POWER button to ON.

2



Insert a video cassette.

3

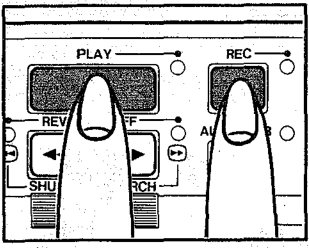

OFF ON
REC LOCK
POWER

Press the REC LOCK button to ON. (For the function of this button refer to page 19.)

Monitoring the playback picture on the camera's viewfinder
The electronic viewfinder enables you to check the recorded material on the spot. To monitor, first rewind the tape, then press the PLAY button.

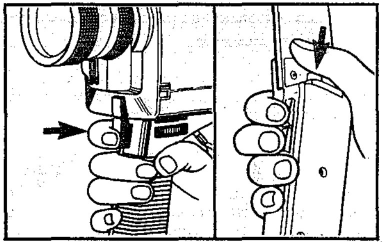
You may have difficulty viewing the very beginning of a tape; to view the first few seconds of a tape that has just been rewound, press the EJECT button, and then reclose the cassette holder; reloading the tape in this fashion winds it back to the very beginning.

4



Press the REC and PLAY buttons simultaneously.
- Make sure that the camera's start/stop switch is in its "stop" position.

5



When you are ready to start recording, press the camera's start/stop switch.
- To temporarily stop recording, simply press the camera's start/stop switch. If this standby mode continues for longer than 5 minutes, power is automatically shut off. To continue shooting, press the POWER button to ON and operate the camera's start/stop switch.

To end recording

Press the STOP button. Then press the REC LOCK and POWER buttons to OFF in that order.

AUTOMATIC BACKSPACE EDITING & RECORDING STANDBY LOCK

The REC LOCK switch is to avoid unnecessary power consumption while in the Recording Standby mode and keeps the tape loaded so that the automatic backspace editing functions to make clean assembled edits when recording is resumed.

A

During playback | PAUSE → POWER OFF → STOP (The tape is unloaded.)

B

During recording | PAUSE* → POWER OFF → STOP (The tape is unloaded.)

C

During recording | PAUSE* → REC LOCK ON → POWER OFF → PAUSE (Standby) (The tape remains loaded and, when power is reapplied, recording starts automatically.)

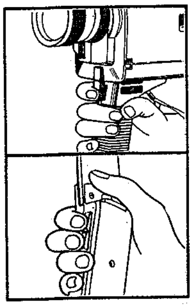
*Entering the Pause mode during recording, the tape rewinds (backspaces) automatically for about 1 second. The automatic Quick Review function allows you to view the playback picture during this 1-second backspacing period for a convenient check of your recording.

Notes

- Playback cannot be started when the REC LOCK button is ON.
- The EJECT button does not function when the REC LOCK button is ON.

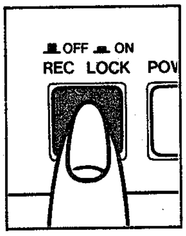
Use the REC LOCK button effectively during camera recording.

1



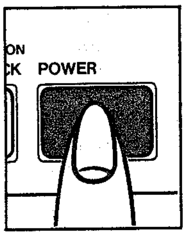
Stop the camera. (The recorder enters the Pause mode.)

2



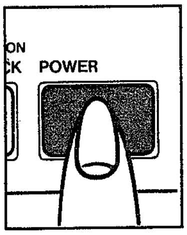
Press the REC LOCK button to ON.

3



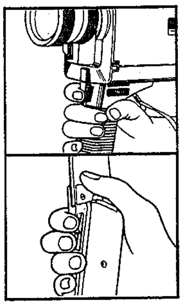
Switch off the power. (Take time to prepare for the next shot.)

4



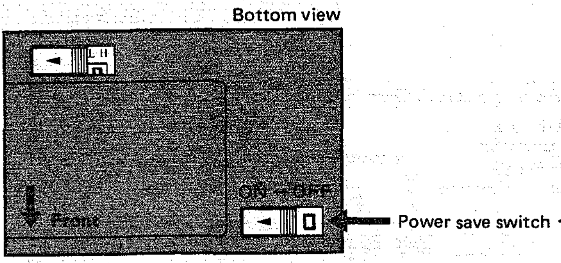
Switch on the power.

5



Start the camera after about 10 seconds.

POWER SAVE FUNCTION


Bottom view
ON ↔ OFF
Front
Power save switch

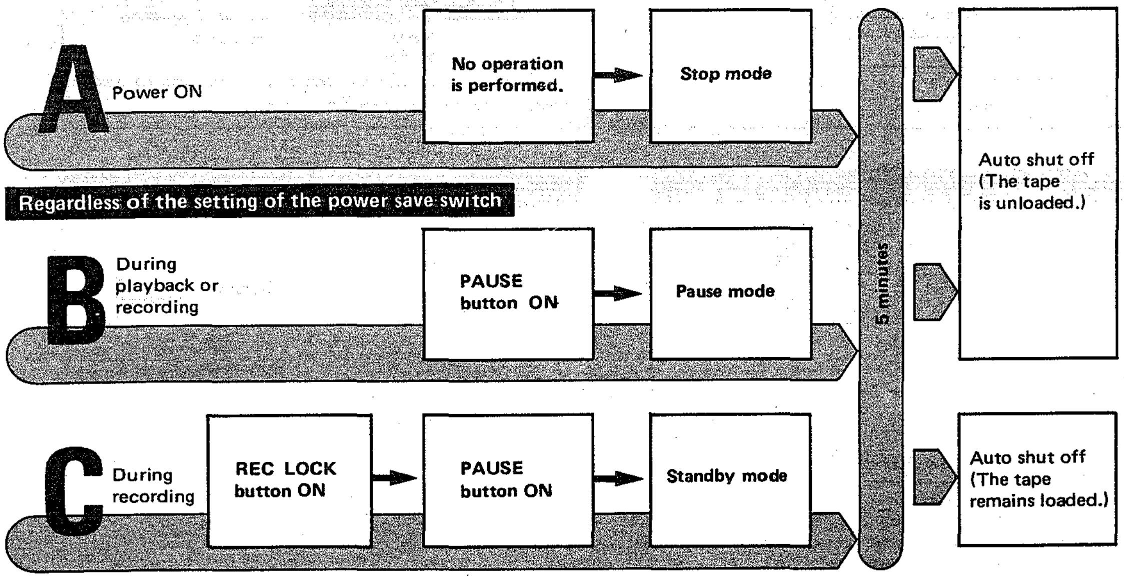
In its ON position, this switch saves power by automatically switching off power if the unit remains in the Stop mode for more than 5 minutes.

Prior to shipment, this switch has been set to ON. If inconvenience results from this condition, reset the switch.

Slide the cover to the left.

Reset the switch to the right with a small screwdriver.

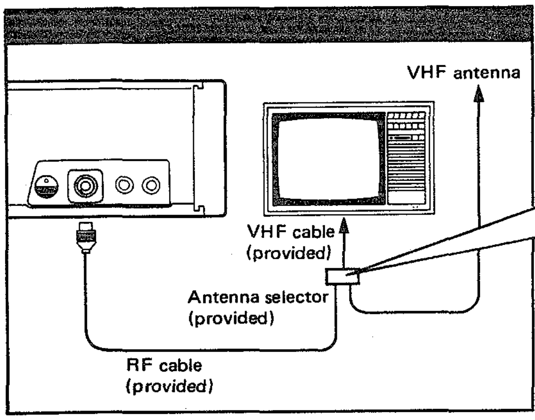
With the power save switch ON


A
Power ON
No operation is performed.
Stop mode
Regardless of the setting of the power save switch
B
During playback or recording
PAUSE button ON
Pause mode
C
During recording
REC LOCK button ON
PAUSE button ON
Standby mode
5 minutes
Auto shut off (The tape is unloaded.)
Auto shut off (The tape remains loaded.)

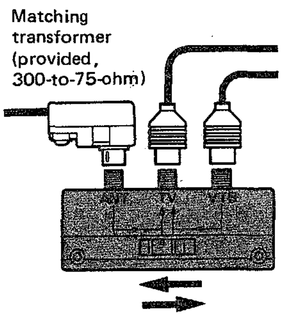
PLAYBACK

Connection

[illegible]


VHF antenna
VHF cable
(provided)
Antenna selector
(provided)
RF cable
(provided)

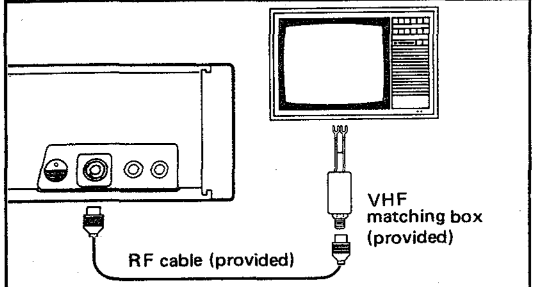
How the antenna selector works


Matching
transformer
(provided,
300-to-75-ohm)
ANT
TV
VTR

- Switch the antenna selector to "ANT" to view a broadcast TV program.
- Switch the antenna selector to "VTR" to view a video tape. When checking what has just been recorded, also switch to "VTR". Then, turn the TV channel to CH-3 or 4.

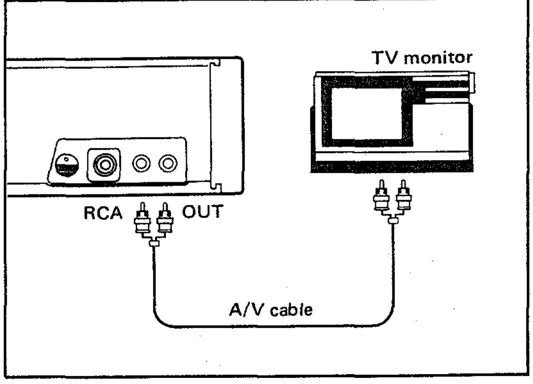
This connection lets you view both TV broadcasts and *video tapes with a single* TV *receiver.*

[illegible]


VHF
matching box
(provided)
RF cable (provided)

If you use a TV receiver temporarily for video playback only, in a hotel for example, simply connect the HR-C3 to the VHF antenna terminal of the TV receiver using the VHF matching box provided.

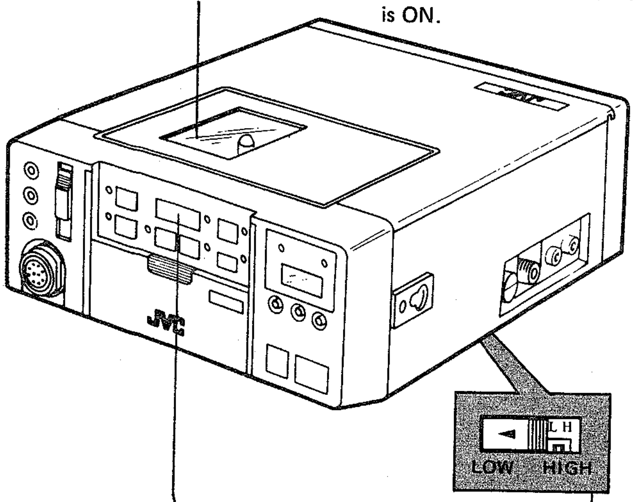
[illegible]


TV monitor
RCA
OUT
A/V cable

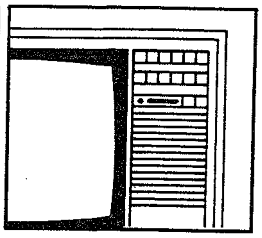
Operation

Insert a prerecorded cassette.

Note:
- Playback cannot be started when the REC LOCK button is ON.

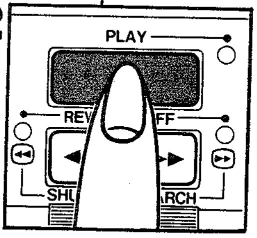


1



Set your TV to CH-3 or 4.

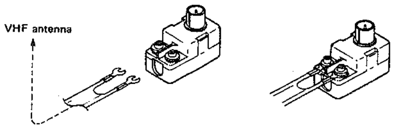
2



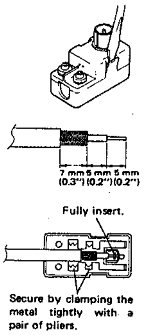
Press the PLAY button.

How to affix the matching transformer to your VHF antenna cable

- If your VHF antenna cable is a 300-ohm flat feeder, connect the two lugs to the screws in an ordinary manner.


VHF antenna

- If your VHF antenna cable is a 75-ohm coaxial cable, proceed as follows:


7 mm 5 mm 5 mm
(0.3") (0.2") (0.2")
Fully insert.
Secure by clamping the metal tightly with a pair of pliers.

1. Pry open the cover with a screwdriver or the like.
2. Strip the coaxial cable with a pair of wire strippers, a knife, or the like as shown.
3. Insert the stripped end of the cable as shown.
4. Replace the cover.

RF CONVERTER ADJUSTMENT

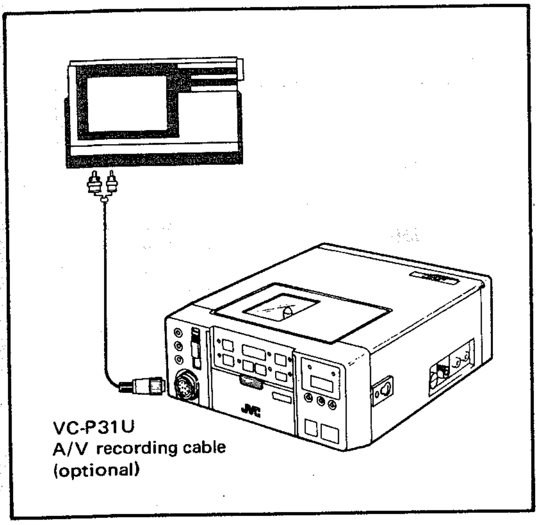
The RF converter in this unit has been set to channel 3 before shipment. If channel 3 is employed for broadcasting in your area, reset the RF converter channel select switch to channel 4 (HIGH) using a screwdriver. Now either channel 3 or 4 becomes your VIDEO CHANNEL. When you wish to view video cassette programs, always set the TV receiver's channel selector to your VIDEO CHANNEL.

RECORDING TELEVISION PROGRAMS

Connection

- When using a TV monitor, connect its AUDIO and VIDEO OUT connectors to the CAMERA connector of the **HR-C3** using the optional VC-P31U A/V recording cable.
- When using a tuner such as the TU-22U, connect its output cord to the CAMERA connector of the **HR-C3** using the optional VC-P32U tuner cable.

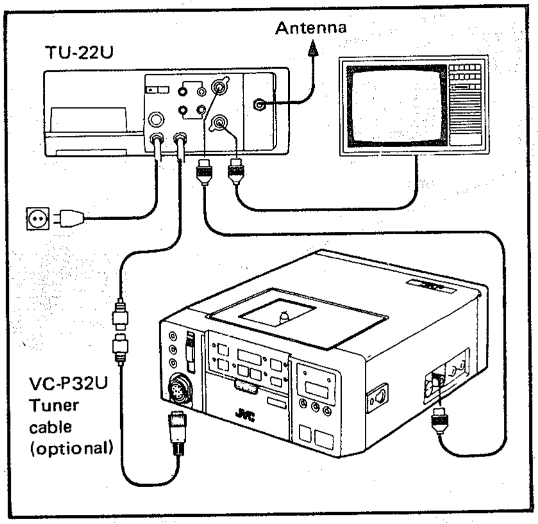
1 Using a TV monitor



Select the program with the channel selector of the TV monitor and press the REC and PLAY buttons of the **HR-C3** simultaneously. To avoid unwanted material, use the PAUSE button. The pause mode can be cancelled by pressing the PLAY button.

- Recording one program while watching another is impossible.

2 Using a tuner

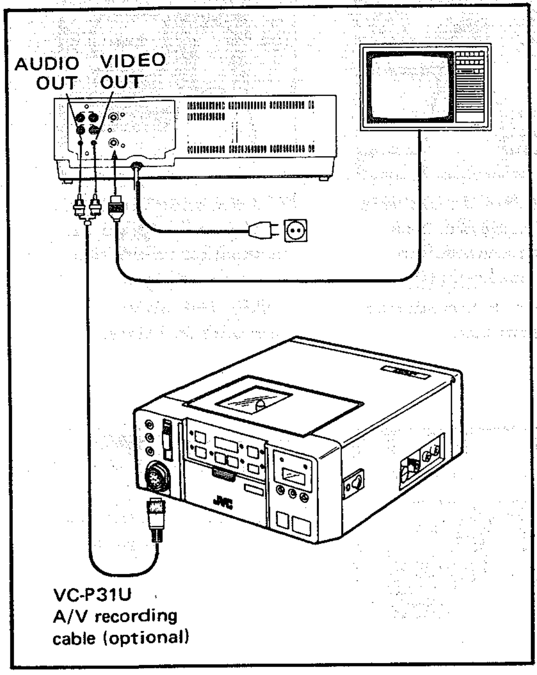


Select the program with the channel selector of the tuner and press the REC and PLAY buttons simultaneously.

- Recording one program while watching another is possible. Refer to the instruction manual for the TU-22U.
- Timer recording is not possible using the **HR-C3** .

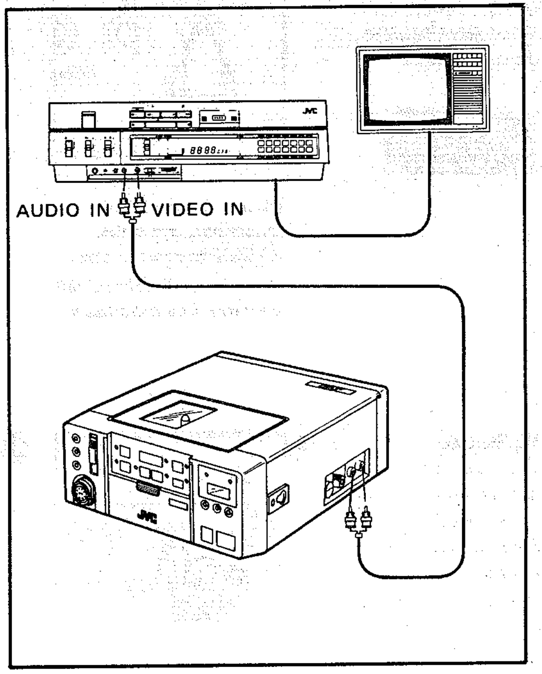
TAPE-TO-TAPE DUBBING

1 Dubbing from another video recorder


AUDIO OUT
VIDEO OUT
VC-P31U
A/V recording
cable (optional)

Play back the tape to be dubbed on the 2nd video recorder and put the **HR-C3** in the Record mode.
To avoid unwanted material, use the PAUSE button. The Pause mode can be cancelled by pressing the PLAY button.

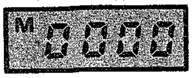
2 Dubbing onto another video recorder


AUDIO IN
VIDEO IN

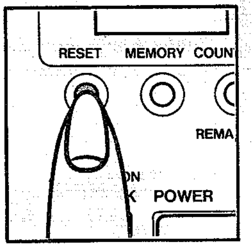
Play back the tape to be dubbed with the **HR-C3** and put the 2nd video recorder in the Record mode.

OTHER CONVENIENT FEATURES

Memory counter
This lets you accurately and quickly locate and play back any required section of the tape.

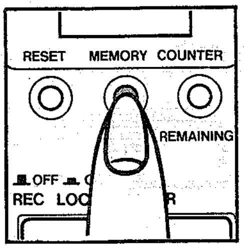


1


RESET
MEMORY COUN
REMA
POWER

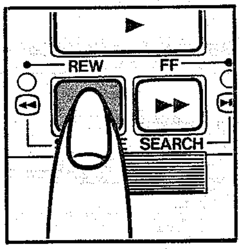
During playback or recording, press the RESET button at the beginning of the section you want to play back.

2


RESET
MEMORY COUNTER
REMAINING
OFF
REC LO

At the end of recording or after playing back the required section, press the MEMORY button; M now appears in the display.

3

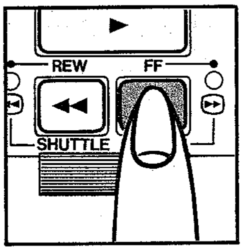

REW
FF
SEARCH

Press the rewind button; the tape will rewind to the position where the counter reading is "0000" and then rewinding will stop.

Shuttle Search
This lets you fast forward and rewind the tape at 3 times normal speed while watching the speeded up picture, to quickly check the content of any section.

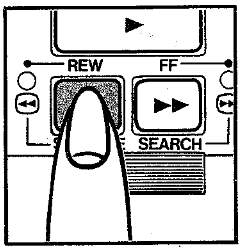
Start playback.

1


REW
FF
SHUTTLE

To shuttle search forward, continue pressing the FF ⏩ button while in the Play mode.

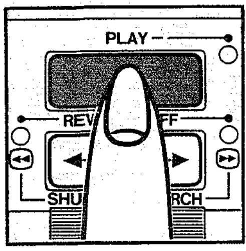
2


REW
FF
SEARCH

To shuttle search in the reverse direction, continue pressing the REW ⏪ button while in the Play mode.

Release your finger; normal playback will resume.
Noise bars in the picture during shuttle search are inevitable.

4

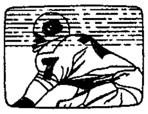


Now press the PLAY button. The required section will be played back.

- The memory counter functions in the fast forward mode as well.

Tracking control

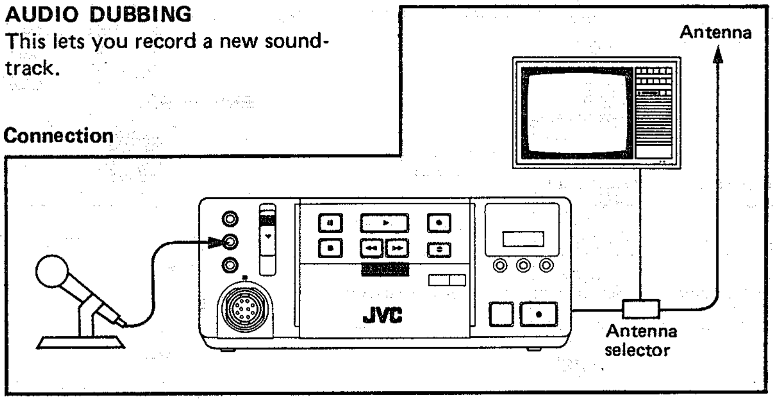
If the playback picture contains noise bars, turn the TRACKING control knob to center. If noise bars still appear, turn the knob slowly in either direction until they move out of the screen. Recording should always be done with this control returned to center.



AUDIO DUBBING

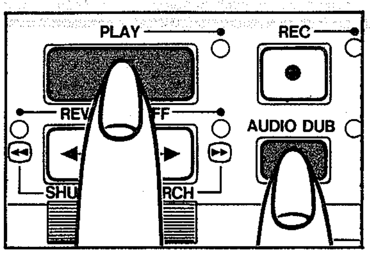
This lets you record a new soundtrack.

Connection



Operation

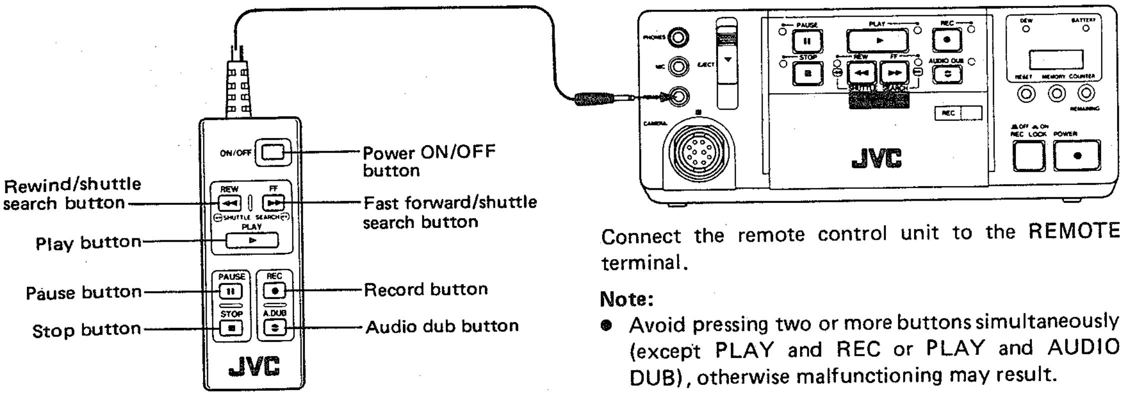
- Load the cassette on which you want to record a new soundtrack.
- Set the TV to the video channel.
- Switch on the power.
- Press the PLAY and AUDIO DUB buttons together.
- Now, while watching the video part of the program on the TV, you can add the narration by speaking into the microphone.
- To stop audio dubbing, press the STOP button.



Notes:

- The previously recorded sound is erased and replaced with a new soundtrack by audio dubbing.
- The pause function facilitates audio dubbing. First play back the prerecorded tape and press the PAUSE button at the point from which you wish to start audio dubbing. Then press the AUDIO DUB and PLAY buttons simultaneously. This permits you to start audio dubbing exactly at the right point.

REMOTE CONTROL

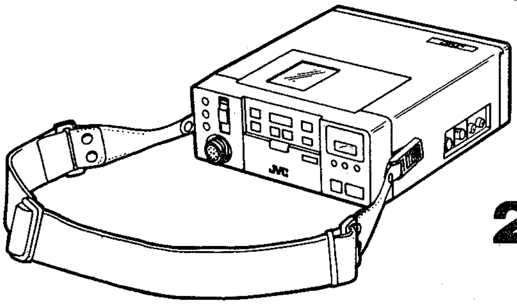

ON/OFF
REW
FF
SHUTTLE SEARCH
PLAY
PAUSE
REC
STOP
A.DUB
JVC
Rewind/shuttle search button
Play button
Pause button
Stop button
Power ON/OFF button
Fast forward/shuttle search button
Record button
Audio dub button
PHONES
MIC
EJECT
CAMERA
AUDIO DUB
REC LOCK
POWER
RESET
MEMORY
COUNTER
DEW
BATTERY

Connect the remote control unit to the REMOTE terminal.

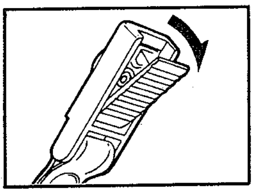
Note:

- Avoid pressing two or more buttons simultaneously (except PLAY and REC or PLAY and AUDIO DUB), otherwise malfunctioning may result.

ATTACHING THE SHOULDER STRAP

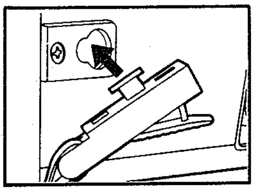


1



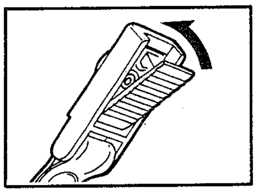
Open the lock caps on both ends of the shoulder strap.

2



Insert the lugs into the holes.

3

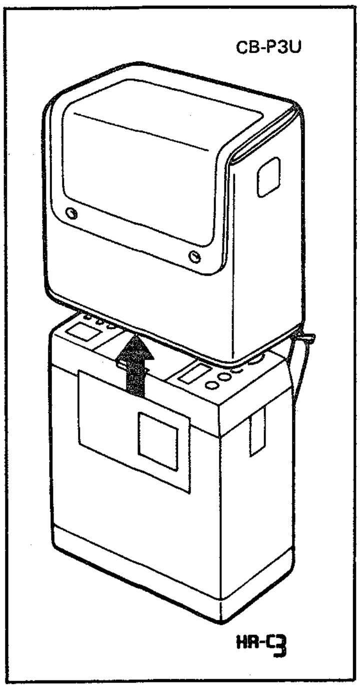


Close the lock caps.

To remove the shoulder strap, first open the lock caps.

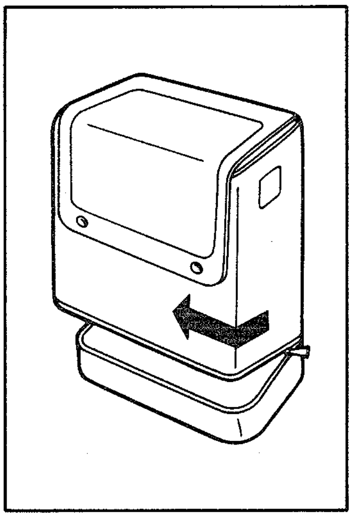
CARRYING CASE

1



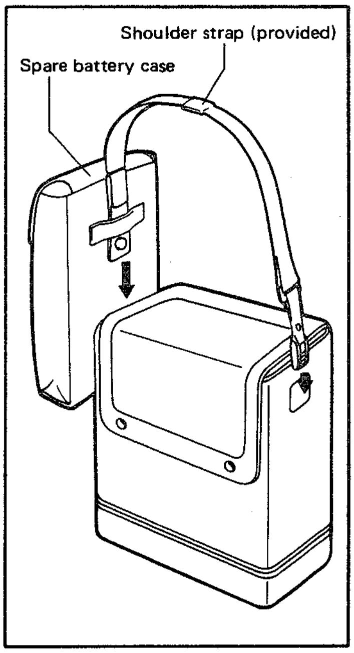
Open the bottom cover and insert the HR-C3 from below as illustrated.

2



When the NB-P4U high-capacity battery pack is attached to the HR-C3 , remove the sponge block. With the NB-P3U regular battery pack, leave the sponge block inside the bottom cover. Zip the cover closed.

3



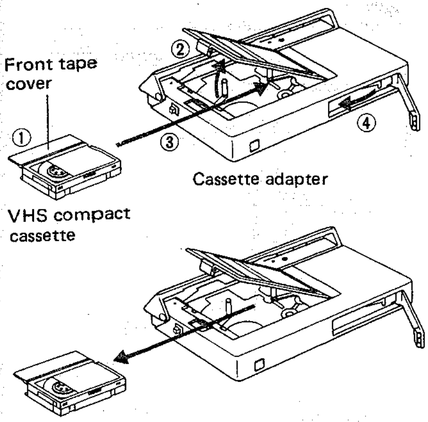
Attach the shoulder strap.

CAUTION

The carrying case is equipped with a belt loop. However, avoid carrying the recorder by attaching it only to your belt. This belt loop is to further stabilize the recorder and hold it next to your body when you are carrying it with the shoulder strap.

CASSETTE ADAPTER C-P1U (Optional)

The VHS compact video cassette can be played back (or even recorded) with a standard VHS machine by using the optionally available cassette adapter.



How to insert a VHS compact video cassette into the cassette adapter

1. Open the front tape cover of the compact video cassette.
2. Open the cassette compartment of the cassette adapter.
3. Insert the cassette into the cassette compartment (as shown) and close the compartment door.
4. Open the side door of the cassette adapter and set the lever inside to the left (toward the center of the adapter). Then close the door.

Removal of the compact video cassette

1. Open the side door of the cassette adapter and set the lever inside to the right (toward the end of the adapter).
2. Using the hole on the underside of the adapter, push up the cassette from below and remove it.

CAUTION:

Slack tape or direct contact with the tape may cause damage to the recorder and/or tape.

- For more detail refer to the instruction manual for the C-P1U.

IN CASE OF DIFFICULTY

Symptoms	Check points
No power.	• Is the battery pack correctly installed? • Is the battery pack charged? • Is the POWER switch of the connected AC power pack set to ON? • Is the car battery adapter correctly plugged in?
Playback is impossible.	• Is the REC LOCK button ON? Press it to OFF.
Recording or audio dubbing is impossible.	• Check to see if the cassette safety tab is in place. Refer to page 4.
Tape stops during fast forward or rewind.	• Is the "M" indication visible in the tape counter? If so, press the MEMORY button to cancel the memory function.
Rewinding or fast forwarding is impossible.	• Check to see if the tape has already been fully wound to one reel or the other.
Tape is running, but no playback picture.	• Is the antenna selector set to "VTR"? • Is the TV receiver set to channel 3 or 4? • If a TV monitor is used, is its TV/VIDEO switch set to VIDEO?
Noise bars appear in the playback picture.	• Use the TRACKING control to remove noise bars. Refer to page 26.
Playback picture is blurred or interrupted while TV programs received are clear.	• Video heads may be dirty or worn out. For head cleaning or replacement, consult the nearest JVC Service Dealer.

HR-C3U SPECIFICATIONS

- Format : VHS standard
- Video signal system : NTSC-type color and monochrome signals, 525 lines
- Video recording system: Luminance: FM recording
  Color: Phase shift & converted subcarrier direct recording
  Rotary, slant azimuth, two-head helical scan system
- Tape width : 12.65 mm (1/2 inch)
- Tape speed : 33.35 mm/sec (1.31 inch/sec)
- Playing time : 20 minutes with TC-20 VHS-C compact video cassette
- Rewind time : Approx. 1 minute with TC-20 video cassette
- Fast forward time : Approx. 2 minutes with TC-20 video cassette
- Shuttle search speed : Approx. 3 times normal speed
- Video
  - Input : 0.5 to 2.0 Vp-p, 75 ohms
  - Output : 1.0 Vp-p, 75 ohms
  - S/N ratio : 45 dB (with Rohde & Schwarz noise meter)
  - Picture resolution : 240 lines
- Audio
  - Mic input : -67 dBs, high impedance, unbalanced
  - Line output : -6 dBs, less than 1 k-ohm, unbalanced
  - Frequency range : 100 Hz to 10 kHz
  - S/N ratio : 40 dB
- RF converter
  - VHF output channel : CH-3 or CH-4, switchable
  - Channel setting : Set to CH-3 prior to shipment
- Power requirement : 12 V DC⎓
- Power consumption : 8 watts
  (18 watts with camera)
  (4.8 watts, nominal in the record mode)
- Weight : 2.0 kg (4.4 lbs)
  : 2.4 kg (5.3 lbs) including battery pack
- Dimensions : 182(W) x 75.5(H) x 203(D) mm
  (7-1/4" x 3" x 8")
  Depth extended to 215 mm (8-1/2") with the NB-P3U attached
- Temperature : Operating: 0°C to 40°C (32°F to 104°F)
  Storage: -20°C to 60°C (-4°F to 140°F)
- Provided accessories
  - Remote control unit RM-P3U
  - Regular battery pack (0.7 AH) NB-P3U
  - Battery charger BB-P3U
  - Carrying case CB-P3U
  - Shoulder strap
  - Antenna selector
  - RF cable
  - 300-to-75-ohm matching transformer
  - VHF cable
  - VHF matching box
  - Video cassette (TC-20)
- Optional accessories
  - Regular battery pack (0.7 AH) NB-P3U
  - High-capacity battery pack (1.2 AH) NB-P4U
  - Battery charger BB-P3U
  - AC power pack AC-P3U
  - Car battery adapter AP-P3U
  - Cassette adapter C-P1U
  - A/V recording cable VC-P31U
  - Tuner cable VC-P32U
  - Video cassette (TC-20)

Design and specifications subject to change without notice.

SECTION 1
GENERAL DESCRIPTION

1.1 VHS-C CASSETTE CONFIGURATION

The VHS-C system employs a smaller size cassette than the VHS system, while maintaining signal and electrical compatibility with the VHS format. Although less than 1/3rd the size of a VHS cassette, the VHS-C cassette can be used in a full size VHS machine by utilizing a special adapter.

Fig. 1-1 illustrates the VHS-C cassette. As can be noted, although the supply reel is conventional, the take-up reel is gear driven. Consequently, the VHS-C recorder possesses only a supply reel disk, while a take-up reel disk is absent.

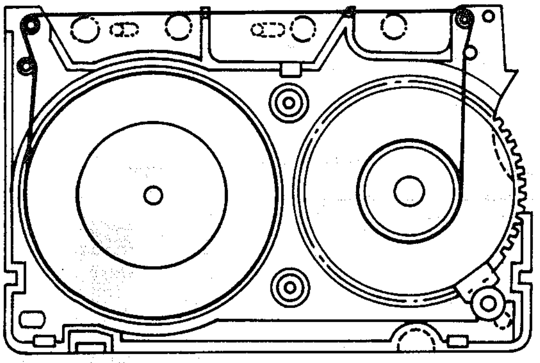


Fig. 1-1 VHS-C cassette

When installed in the cassette adapter, the internal poles of the adapter position the tape in the same configuration as a conventional VHS cassette. This is indicated in Fig. 1-2.

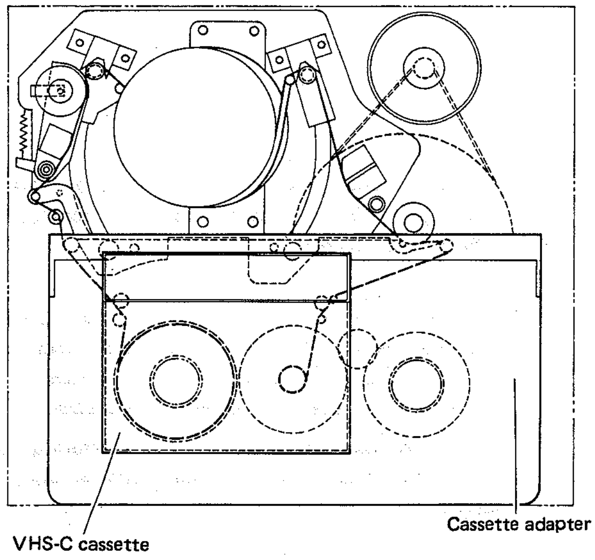


Fig. 1-2 Cassette adapter

At this time, the supply reel of the VHS-C cassette becomes driven by the supply reel disk of the VHS recorder. For driving the take-up reel, rotation of the take-up reel disk is transferred by a pulley and gear. Fig. 1-3 shows this system.

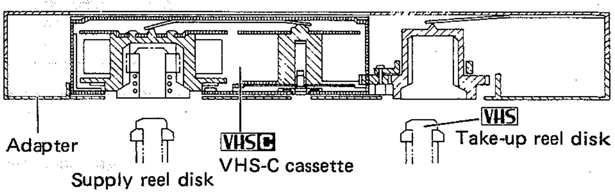


Fig. 1-3 Adapter reel drive method

1.2 VHS-C CASSETTE OUTLINE

JVC Version : Type TC-20, 20 minutes
VHS-C logo displayed prominently on cassette and package

1. Video Tape

   Tape Length : 43.7^{+2}_{-0} meters

   Tape Thickness : 19^{+1}_{-2} μm

   Other video tape specifications are the same as those for the VHS format.

2. Leader and Trailer Tape

   Leader Tape Length : 80 ± 5 mm

   Trailer Tape Length : 110 ± 5 mm

   Leader & Trailer
   Tape Thickness : 20^{+2}_{-6} μm

   Leader & Trailer
   Tape Transparency: Greater than 70 %

   Other leader and trailer tape specifications are the same as those for the VHS format.

3. Dimensions & Appearance: See Fig. 1-4.

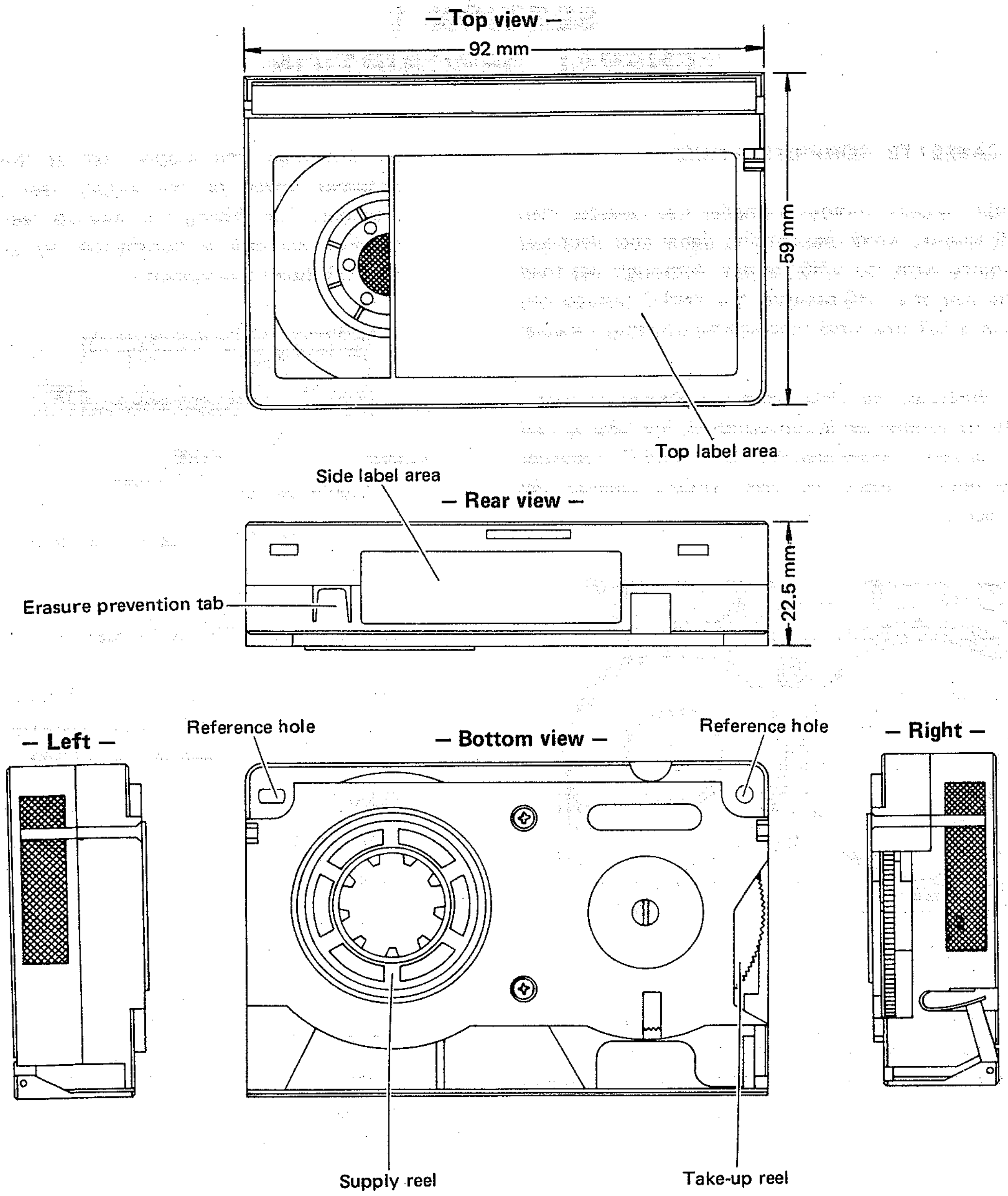

– Top view –
92 mm
59 mm
Top label area
Side label area
– Rear view –
22.5 mm
Erasure prevention tab
– Left –
Reference hole
– Bottom view –
Reference hole
– Right –
Supply reel
Take-up reel

Fig. 1-4 Dimensions & Appearance

1.3 HR-C3U FEATURES

1. Compact, lightweight, low power consumption

   Mainframe weight : Approx. 2 kg
   Power consumption : Approx. 4.8 W in Record mode;
   5.0 W in Playback mode
   30 minutes operation with NB-P3;
   50 minutes with NB-P4

2. AEF (Automatic Editing Function) system
   This unit incorporates a back-space editing system with back-review function. When the PAUSE button is pressed during recording, a one second segment of the tape becomes rewound, then the Pause stand-by mode is entered. Pressing the PLAY button at this time yields playback for 0.9 sec, then recording becomes resumed with 0.1 sec overlap.

3. Power save circuit
   With the POWER SAVE switch on, the unit will automatically switch off power if the Stop mode continues for more than 5 minutes. This feature aids in reducing power consumption during battery operation.

   The power save circuit also functions during operation from other than battery power, such as using the AC adapter.

4. Battery warning system
During battery operation, when the voltage declines below 10.7 V, the BATTERY LED begins flashing. At less than 10.3 V, the unit automatically enters the Stop mode and power is switched off. This aids in avoiding problems due to excess battery drainage.

5. Remote control capability
The remote control unit allows operation of all main functions, including power on/off from a distance.

6. Shuttle search functions
Shuttle Search in both FF and REW directions can be performed at three times normal playback speed. In the FF direction, capstan motor control locks the noise bars at the upper and lower edges of the picture area to prevent noise bar rolling. However, this feature does not operate in the REW direction due to excess tape travel variations.

7. Tape counter
The liquid crystal display (LCD) tape counter also provides indication of tape remaining time. Remaining time is displayed in minutes from 23:00 to 5:00, and in seconds from 4:59 to 0:00.

- Power on/off control
Power on/off can be controlled from the front panel POWER switch, the power switch of the remote control unit, and from the camera remote power switch (provided that the employed camera is equipped with this feature).

- Recording lock system
This functions only in the Recording mode. Note that the Play mode cannot be entered if the REC LOCK button is depressed to the on position.

  During recording with the REC LOCK button depressed, if the power is switched off, a one second segment of the tape becomes rewound automatically, then the pinch roller disengages from the capstan and the power is cutoff. When power is returned, the pinch roller re-engages and after 2 to 3 seconds, the servos lock to enable recording. This becomes the Recording-Pause mode. At the recording start command, the tape is played back for 0.9 sec, then recording resumes with 0.1 sec (approx. 3 frames) overlap.

- Switching regulator circuit
The switching regulator circuit supplies power in five lines (regulated 5 V and 9 V, and power for the reel, capstan and drum motors) in order to minimize circuit power consumption.

- Tape sensor
A cassette lamp is not employed due to space considerations. The reel pulse is detected during the Fast Forward and Rewind modes. In the Play and Search-FF modes, tape end is detected by an LED and photo transistor, which activate the auto stop function.

- Capstan motor
A recently developed brushless direct drive (DD) motor is used for the capstan. The motor drive amplifier (MDA) IC is incorporated in the capstan DD motor assembly.

- Drum motor
This is a newly designed slim type brushless DD motor.

SECTION 2
MECHANISM DESCRIPTION

2.1 FUNCTION OF MAIN PARTS

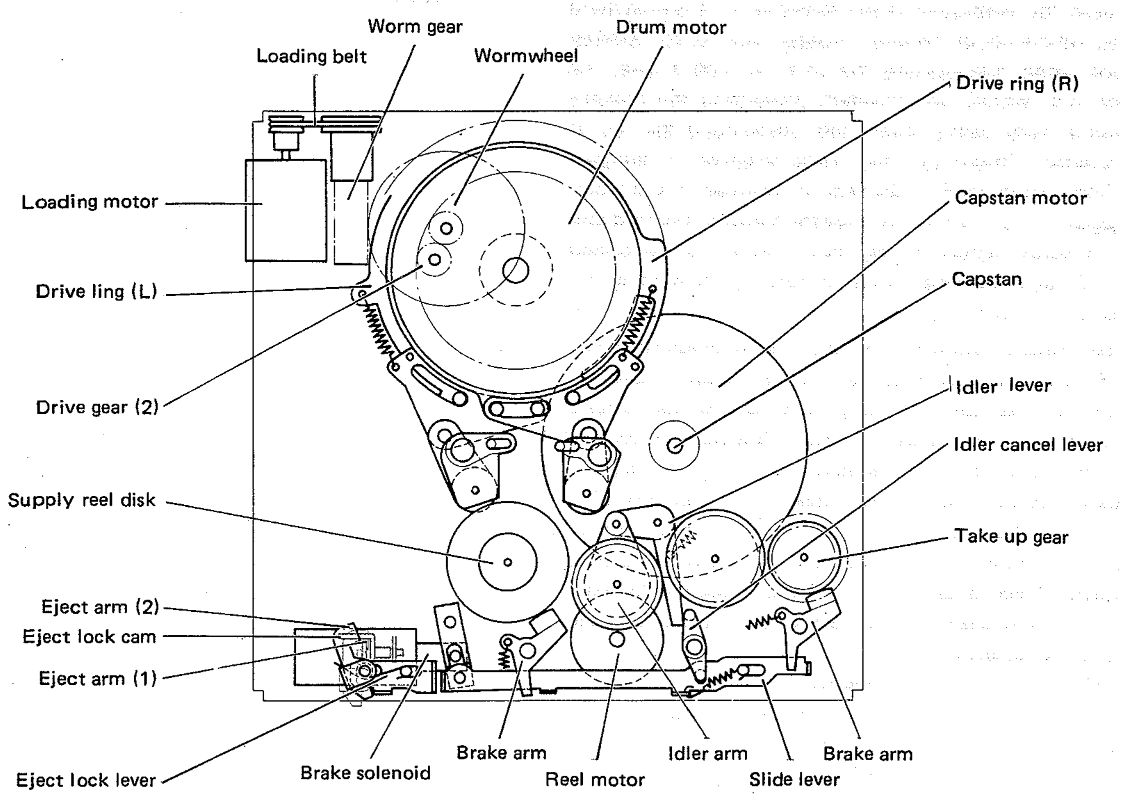

Worm gear
Drum motor
Loading belt
Wormwheel
Drive ring (R)
Loading motor
Capstan motor
Capstan
Drive ling (L)
Drive gear (2)
Idler lever
Idler cancel lever
Supply reel disk
Take up gear
Eject arm (2)
Eject lock cam
Eject arm (1)
Eject lock lever
Brake solenoid
Brake arm
Reel motor
Idler arm
Brake arm
Slide lever

Fig. 2-1

2.1.1 Drum motor

Drives the rotating video heads.

2.1.2 Capstan motor

Drives the capstan in forward and reverse directions.

2.1.3 Reel motor

Drives the take-up pulley or the supply reel disk in forward and reverse directions via an idler arm.

2.1.4 Loading motor

Drives the drive rings in forward and reverse directions.

1. The loading motor rotation is transmitted to the worm gear by the loading belt. The rotation of the worm gear causes the worm wheel to rotate. Two gears are attached to the worm wheel; one directly drives the drive ring (L), and the other drives the drive ring (R) via a drive gear (2). By employing this drive gear (2), the drive ring (R) can be driven in the opposite direction from drive ring (L).

2.1.5 Brake solenoid

Controls the brake arms and the idler arm via a slide lever. Also controls the eject lock system.

1. When the solenoid switches ON, the slide lever is drawn in and moves to the left. Thereby, the bent sections of the brake arms are pushed and the arms are caused to turn clockwise. The brake arms are detached from the supply reel disk and the take-up gear, and the brake pressure is released.
2. When the solenoid becomes ON and the slide lever is moving, the idler cancel lever which rests in a groove on the slide lever starts to turn clockwise. Thereby the idler cancel lever ceases to depress the idler lever, and the idler lever turns counterclockwise, driven by spring force. Now the idler arm attached to it is locked to the reel motor.
3. When the solenoid becomes ON and the slide lever is moving, the bent section on the left tip of the slide lever presses the eject lock lever to the left. The bent section on the eject lock lever trips the eject lock cam and causes it to rotate clockwise. Thereby the eject lock cam blocks the ejecting action of the eject arm (1) in the cassette housing.

.2 MODE DESCRIPTION

.2.1 Stop mode

When power is applied, the brake solenoid immediately performs the OFF operation. This design was adopted because the employed brake solenoid is of the latching type, which could become engaged due to an external shock while transporting the unit. In such a case, the eject lock would be activated, preventing the cassette housing from being raised and obstructing the use of a cassette. Therefore, the brake solenoid is designed to first switch OFF, regardless of whether it is actually engaged or not. When the cassette housing is locked and the cassette switch is ON, short Rewind is performed for 0.2 seconds. This serves to take up tape slack if a cassette is inserted.

If the cassette switch is OFF, the brake solenoid switches OFF, but short Rewind is not performed. However, when the cassette housing is lowered and the cassette switch thereby becomes ON, short Rewind is performed for the duration of 1 second. This longer interval is chosen because the inserted cassette is presumed to be set at the tape-end position. With the VHS C system, the luminating part for tape-end detection is located outside of the cassette, and tape-end detection can only be performed after a certain amount of tape was pulled out of the cassette.

Actually, end-of-tape sensing operation is only initiated after the loading process is completed, and therefore loading is performed first, also if the cassette is set at the tape end. During loading the tape is pulled out from the supply side (for details see the section on Loading mode), but because the leader tape is rather short, there is no sufficient amount of tape if the cassette is at the end position, and the tape would therefore be subjected to considerable strain. To prevent this, short Rewind is carried out whether the tape is set at the end or not, to make sure that sufficient tape length is available. The short Rewind operation is similar to the regular Rewind operation, as described in the section on the Rewind mode.

The condition when the eject lock is released and a cassette can be inserted or removed is called the Stop mode. In this condition, the drum, reel, capstan and loading motors are all stationary. Also, the brake arms are applied to the supply reel disk and the take-up gear, to prevent uncontrolled rotation of the cassette reels and tape slackening. The supply pole base, take-up pole base and the tension pole are positioned in readiness for extracting the tape from the cassette, that is within the cassette if one is inserted. Of course, the pinch roller is separated from the capstan so as not to interfere with cassette insertion or removal. The movable audio/control head is now positioned so as not to obstruct the movement of the take-up pole base for the loading process. The idler arm is in a center position released from both the supply reel disk and the take-up pulley. The ON or OFF condition of the cassette switch depends on the position (raised or lowered) of the cassette housing, but the unloading switch is ON and the loading switch is OFF.

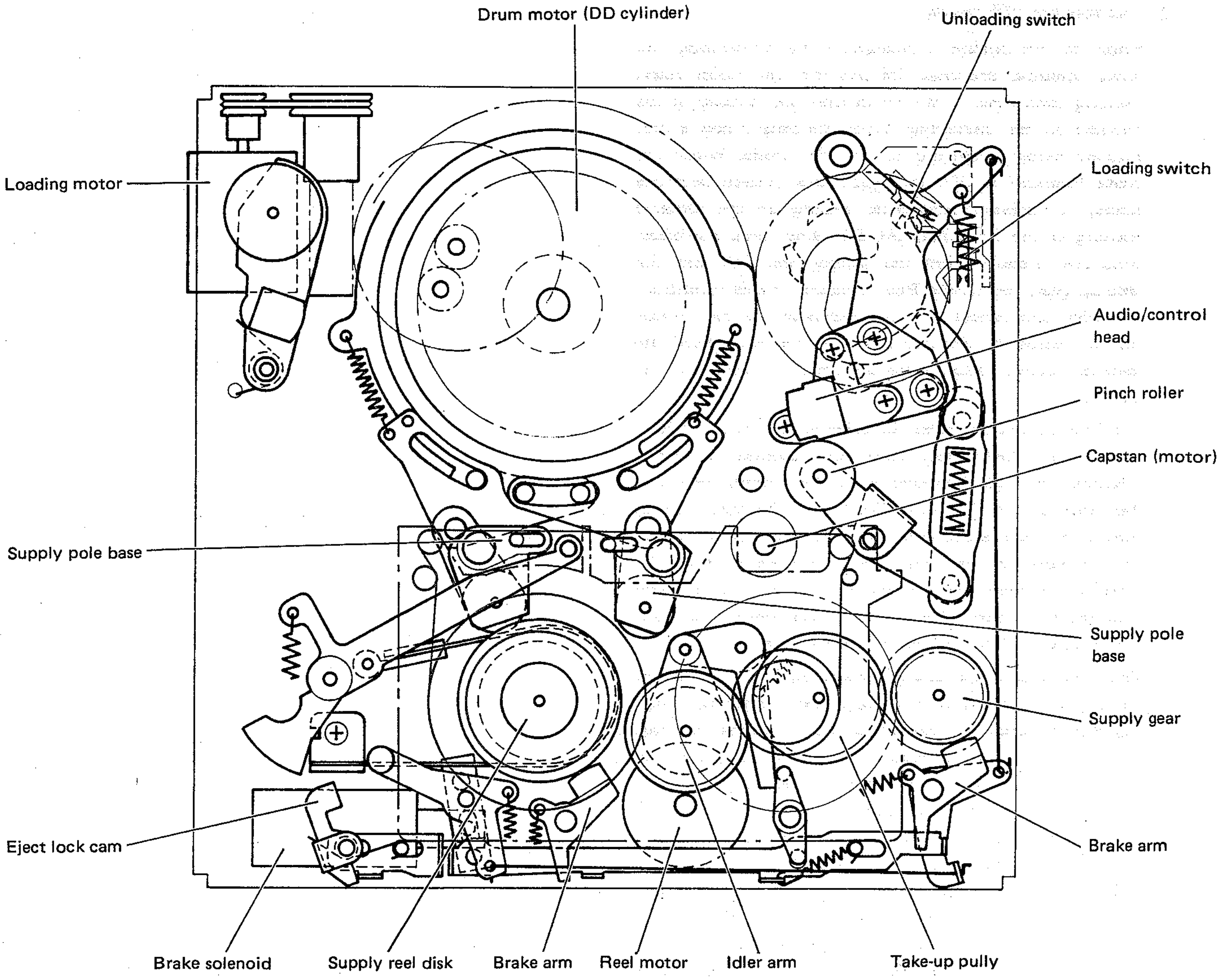

Drum motor (DD cylinder)
Unloading switch
Loading motor
Loading switch
Audio/control head
Pinch roller
Capstan (motor)
Supply pole base
Supply pole base
Supply gear
Eject lock cam
Brake arm
Brake solenoid
Supply reel disk
Brake arm
Reel motor
Idler arm
Take-up pully

Fig. 2-2

.2.2 Fast-forward (FF) mode

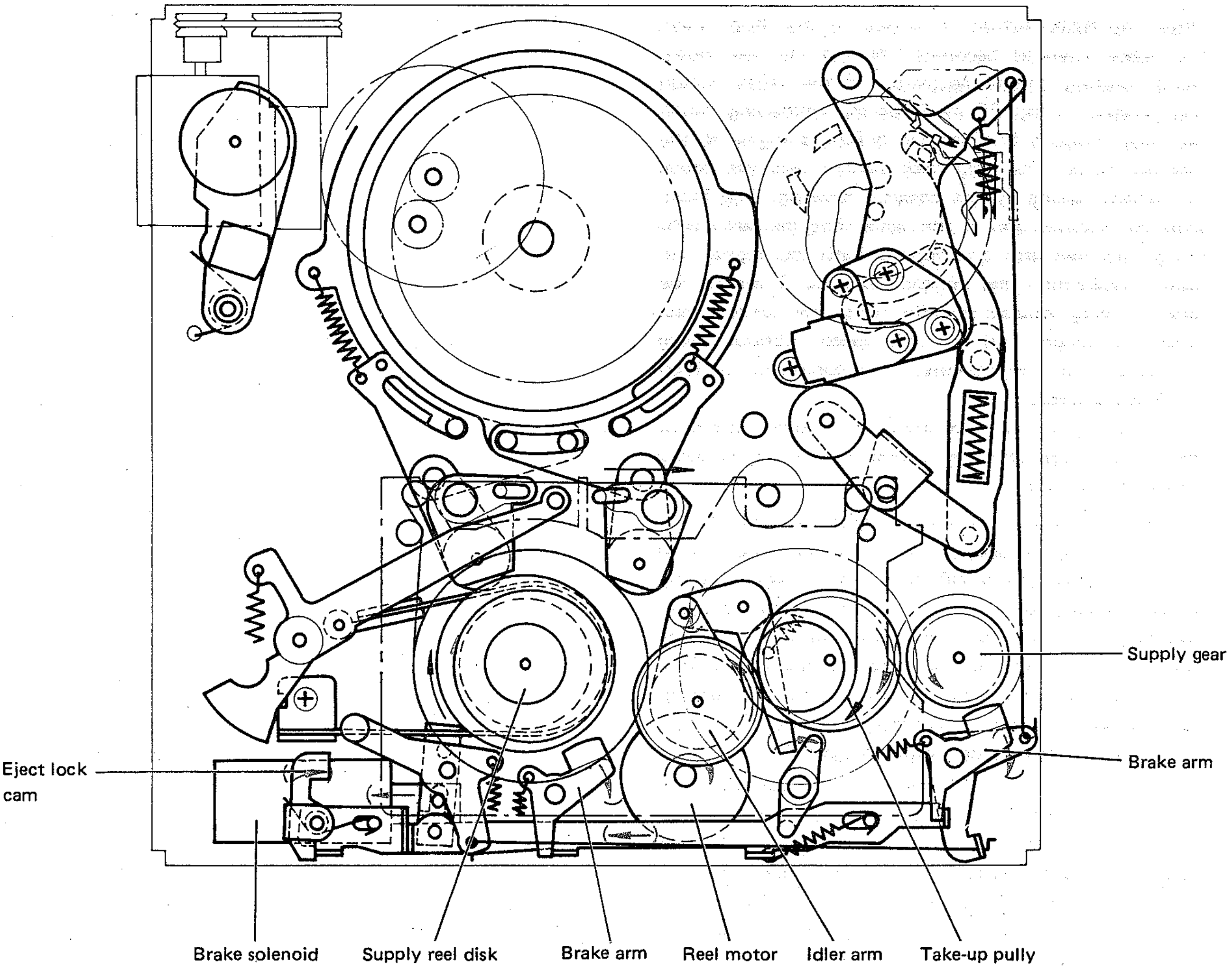
When the FF button is pressed in the Stop mode, the brake solenoid becomes ON and the reel motor starts rotating clockwise. If the FF button was pressed in the Rewind or the Unloading mode, the Stop mode is first entered before changing to the FF mode. When the brake solenoid is ON, the eject lock system becomes active, to prevent accidental raising of the cassette housing in the FF mode. At the same time, the brake arms are released from the supply reel disk and the take-up gear, permitting free rotation. In this condition, the idler arm comes into contact with the reel motor and is pressed by the reel motor's rotation against the take-up pulley, transmitting the motor rotation to the pulley.

The take-up pulley drives the take-up gear which in turn causes the take-up reel inside the cassette to rotate. Thereby the tape is wound from the supply reel onto the take-up reel. The condition when the tape is being wound at high speed directly from the supply reel to the take-up reel without being extracted from the cassette is called the FF mode. The reel motor starts rotating at a lower speed in the initial stage to prevent undue strain from being placed on the tape.

The FF mode is terminated when the STOP, PLAY or REW key is pressed or if the tape end is detected. When the STOP switch is pressed in the FF mode, the reel motor is immediately stopped, and the brake solenoid becomes OFF, causing the brake arms to contact the supply reel disk and the take-up pulley, thereby stopping the reel rotation. At the same time, the idler arm is released from the take-up pulley and the reel motor. The eject lock is also released and the Stop mode is entered momentarily, after which short Rewind of approx. 0.2 seconds is performed, to wind up any take slack onto the supply reel. Then the Stop mode is entered again.

When the PLAY or REW button was pressed in the FF mode, the Stop mode is also entered momentarily, but short Rewind is not performed and the Loading mode or Rewind mode is entered directly.

When the tape end was detected, the operation is practically the same as when the STOP button was pushed, but the duration of short Rewind is extended to approx. 1 second, to provide sufficient tape length on the supply reel for loading. Tape-end detection is performed by detecting the rotation of the supply reel disk. Therefore, when the reel disk has stopped, a considerable strain is placed on the tape for approx. 1 second, as this is the required interval until the reel motor stops after the rotation of the reel disk has ceased. However, this strain is alleviated by the clutch action of the take-up gear.


Supply gear
Brake arm
Eject lock cam
Brake solenoid
Supply reel disk
Brake arm
Reel motor
Idler arm
Take-up pully

(→) Shift from stop to FF mode
→ FF mode operation

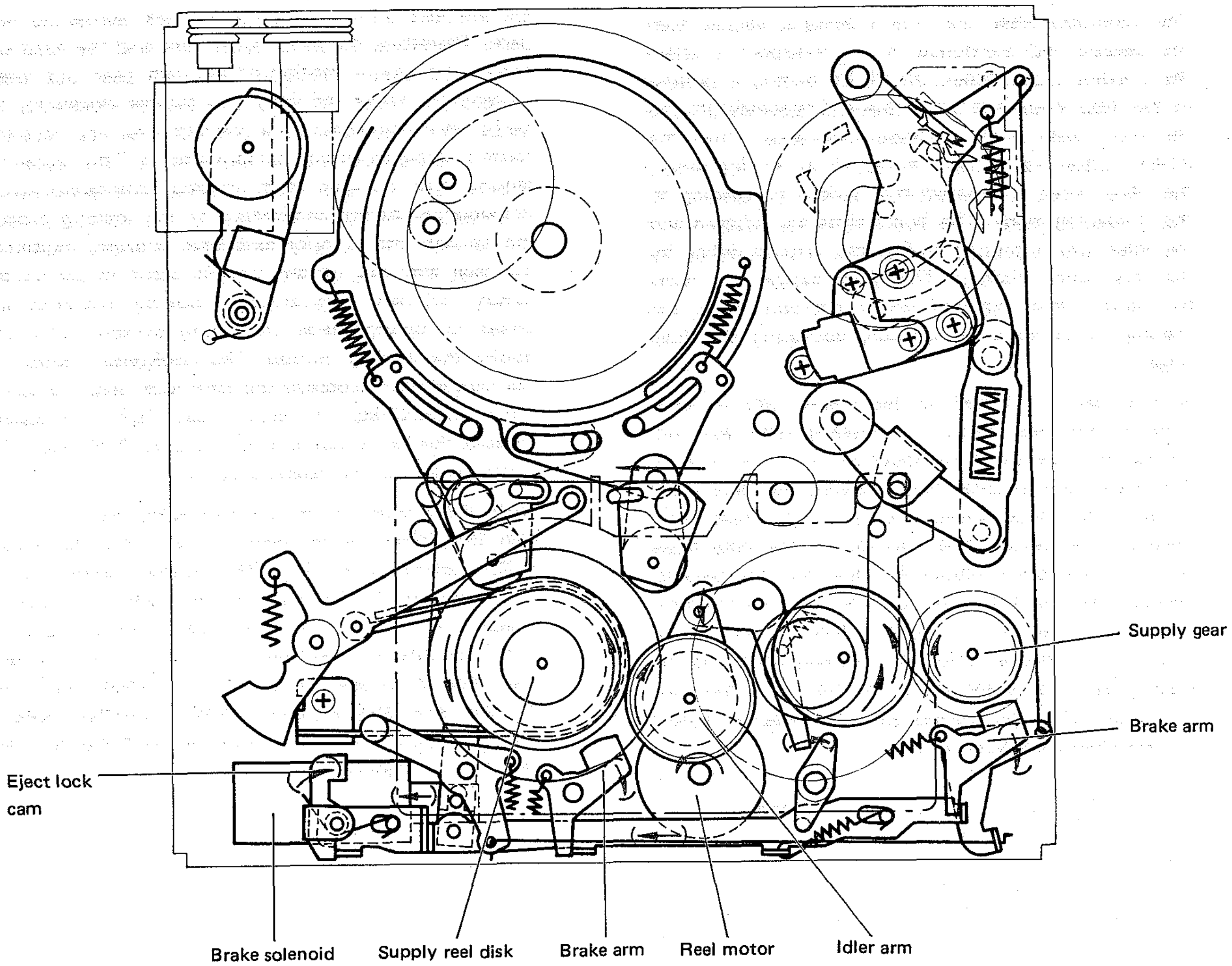
Fig. 2-3

.2.3 Rewind (REW) mode

When the REW button is pressed in the Stop mode, the brake solenoid becomes ON and the reel motor starts rotating counterclockwise. If the REW button was pressed in the FF mode or the Unloading mode, the Stop mode is first entered before changing to the Rewind mode. The eject lock system becomes active to prevent raising of the cassette housing. The brake arms are released and at the same time the reel motor brings the idler arm into contact with the supply reel disk, transmitting the motor rotation. Thereby, the tape is being wound directly from the take-up reel onto the supply reel at high speed without being extracted from the cassette. This condition is called the Rewind mode.
The reel motor starts rotating at a lower speed in the initial stage to prevent undue strain from being placed on the tape.

The Rewind mode is terminated when the STOP, PLAY or FF button is pressed or when the tape end is detected. When the STOP switch is pressed, the reel motor immediately stops and the brake solenoid becomes OFF, activating the brake arms to stop the tape winding. The unit momentarily enters the Stop mode, but then short Rewind of approx. 0.2 seconds is performed, to wind up any tape slack onto the supply reel. Then the Stop mode is entered again.

When the PLAY or FF button was pressed, the Stop mode is also entered momentarily, but short Rewind is not performed and the Loading mode or Rewind mode is entered directly. When the tape end was detected, after momentarily entering the Stop mode, approx. 1 second of Short FF is performed and then the Stop mode is entered again. If the tape is left at the very beginning, a large strain would be placed on it the next time it is lowered in the cassette housing for use, setting the cassette switch to ON and causing short Rewind to be performed. The programmed short FF serves to prevent this condition. Because there is still a possibility that a cassette will be used from the very beginning, the supply reel disk employs a clutch construction to reduce the strain on the tape in such a case. The main aim of this construction is also to alleviate the considerable strain placed on the tape during tape end detection. This detection is performed by detecting rotation of the take-up gear. After the take-up gear rotation has stopped, approx. 1 second is needed until the reel motor switches off.


Supply gear
Brake arm
Eject lock cam
Brake solenoid
Supply reel disk
Brake arm
Reel motor
Idler arm

(→) Shift from stop to REW mode
→ REW mode operation

Fig. 2-4

2.4 Loading mode

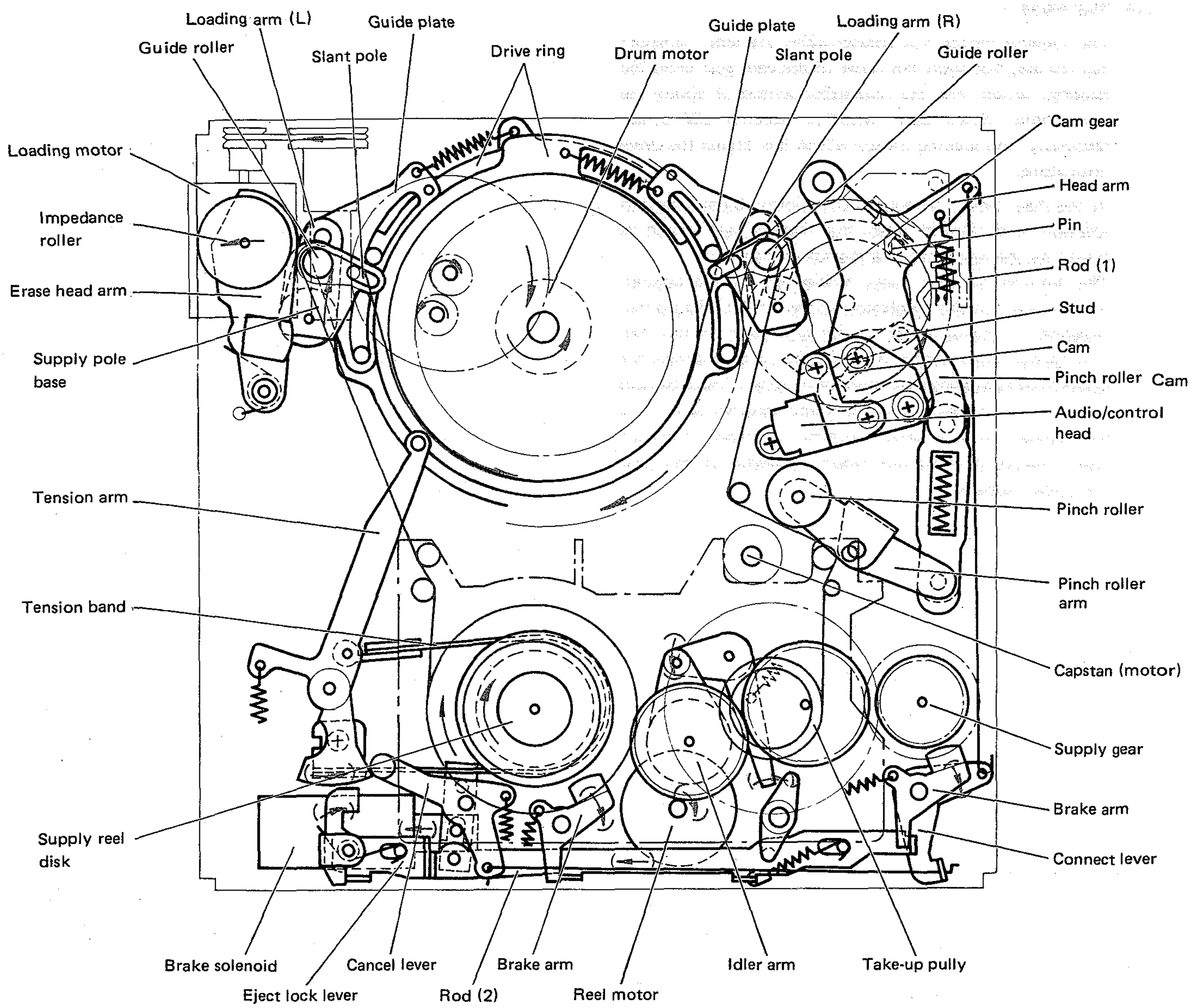
The condition while the tape is being extracted from the cassette and positioned in the transport is called the Loading mode. When the PLAY button is pressed in the Stop mode, the brake solenoid becomes ON and the reel motor starts rotating clockwise. When the PLAY button was pressed in the FF or Rewind mode, the Stop mode is entered first before proceeding to the Unloading mode. The brake arms are released and the idler arm is pressed against the take-up pulley by the reel motor rotation. The drum motor also starts to rotate. When the reel motor rotation stops, the loading motor starts to operate, activating the drive rings.

A pole base is attached to the loading arm on both sides of the main deck. The loading arms are connected to guide plates incorporated in the drive rings. Prompted by the drive ring rotation, the pole bases move in the narrow grooves on top of the main deck. Thereby the slanted poles on top of the pole bases and the guide rollers extract the tape from the cassette. Because the idler arm is in loose contact with the take-up pulley, exterting a braking influence, the take-up gear's clutch torque serves as a loading brake. As the supply reel can rotate freely at this time, the tape extracted during the loading process is supplied almost entirely from the supply reel.

In Stop mode, the tension arm is held in place by the supply pole base, but when the Loading mode is entered and the supply pole base shifts, spring force turns the tension arm counterclockwise, until it is stopped by the cancel lever. When the tension arm shifts, a part of it blocks the eject arm (2) inside the cassette housing, causing eject lock. This may seem to be unnecessary because in the Loading mode the brake solenoid will not become OFF under any circumstances, but actually it is required for the REC Lock Power-off mode. As loading continues, the supply pole base moves the tape while pushing the erase head arm out of the way. When the supply pole base has passed, the erase head arm returns to its original position by spring force, and the impedance roller contacts the tape.

The impedance roller serves to dampen vertical vibrations of the tape, which can contribute to picture jitter and audio wow-and-flutter. At about the point when the supply pole base pushes the erase head arm away, the action of the cam gear locked to the drive gear sets the audio/control head and the pinch roller in motion. The pinch roller is connected to the pinch roller cam, whose stud in turn rests in a groove on the cam gear. The audio/control head is fixed to a head arm, whose pin also rests in a groove on the cam gear across the main deck. Therefore, the pinch roller cam and the head arm follow the groove motion of the cam gear and rotate accordingly. When the head arm rotates clockwise, the cancel lever connected via a connect lever and rods also starts rotating clockwise by spring force. This causes the tension arm to again start rotating counterclockwise. Immediately before completion of the loading process the tension arm is fully extended, thereby thgitening the tape and causing the tension band to act on the supply reel disk. This exerts a braking influence and serves to prevent tape slackening caused by inertia during the loading motion. The clockwise rotation of the cancel lever depresses the eject lock lever by spring force, maintaining the eject lock. This is necessary because the brake solenoid can become OFF even with extracted tape in the Pause mode, etc.

When the tension arm is fully extended, the cam of the cam gear driven by the drive ring depresses the loading switch, setting it ON. Now the capstan motor and the reel motor start rotating. The cam gear continues to rotate, and when it sets the loading switch again to OFF, the tape is completely set in the transport system. The tape is engaged between the pinch roller and capstan, and tape transport starts. The Play mode is now entered, but the drive rings still continue to rotate and drive the cam gear for some time.


Loading arm (L)
Guide plate
Guide roller
Slant pole
Drive ring
Drum motor
Guide plate
Slant pole
Loading arm (R)
Guide roller
Cam gear
Loading motor
Head arm
Impedance roller
Pin
Rod (1)
Erase head arm
Stud
Supply pole base
Cam
Pinch roller Cam
Audio/control head
Tension arm
Pinch roller
Pinch roller arm
Tension band
Capstan (motor)
Supply gear
Brake arm
Supply reel disk
Connect lever
Brake solenoid
Cancel lever
Brake arm
Idler arm
Take-up pully
Eject lock lever
Rod (2)
Reel motor

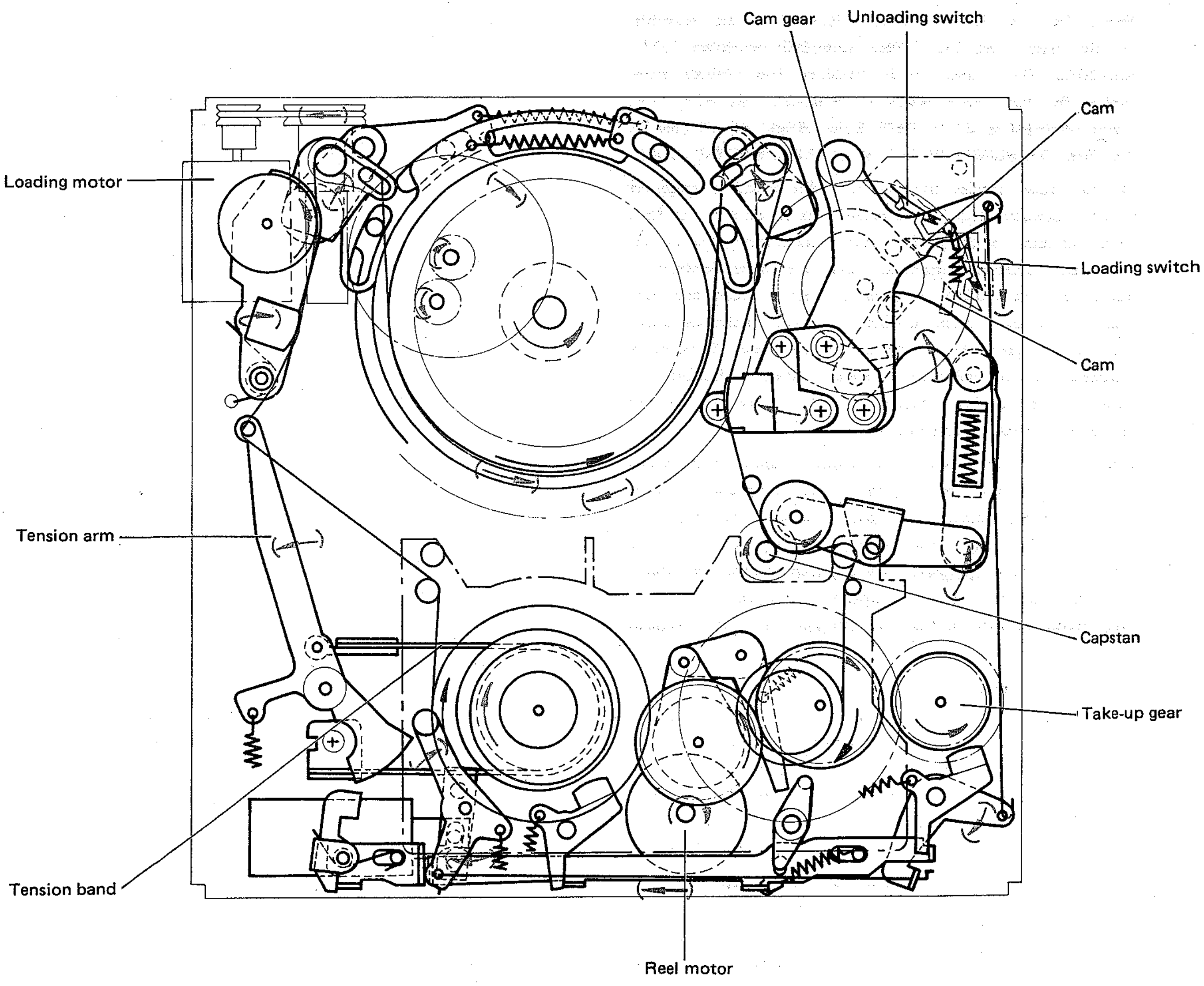
(→) Shift from stop to Loading mode
→ Loading mode operation

Fig. 2-5

2.5 Play mode

The loading motor still rotates after the tape transport has started, but soon the cams of the cam gear press the loading switch and the unloading switch at about the same time. When both switches become ON simultaneously, the loading motor which has driven the drive rings stops.

In the Play mode, the tape is transported by the capstan rotation and wound onto the take-up reel which is driven by the reel motor via the take-up gear.
The amount of tape being forwarded by the capstan is constant, but the revolution speed of the take-up reel depends on the diameter of the tape pack on the reel. The clutch construction of the take-up gear allows for smooth compensation of these parameters. Tape tension is controlled by the tension arm and tension band. This mechanical tension servo system maintains constant tape tension at the drum input regardless of changing reel pack diameters.


Cam gear
Unloading switch
Cam
Loading motor
Loading switch
Cam
Tension arm
Capstan
Take-up gear
Tension band
Reel motor

(→) Shift from Loading to play mode
→ Play mode operation

Fig. 2-6

.2.6 Pause mode

1. Play Pause mode
   When the PAUSE button is pressed in the Play mode, the capstan stops to interrupt the tape transport. Next, the reel motor stops, interrupting the winding of the tape, and the brake solenoid becomes OFF, activating the brake arms. Because the cancel lever keeps the eject lock lever in position also when the brake solenoid is OFF, there is no danger of damage to the tape by accidental raising of the cassette housing.

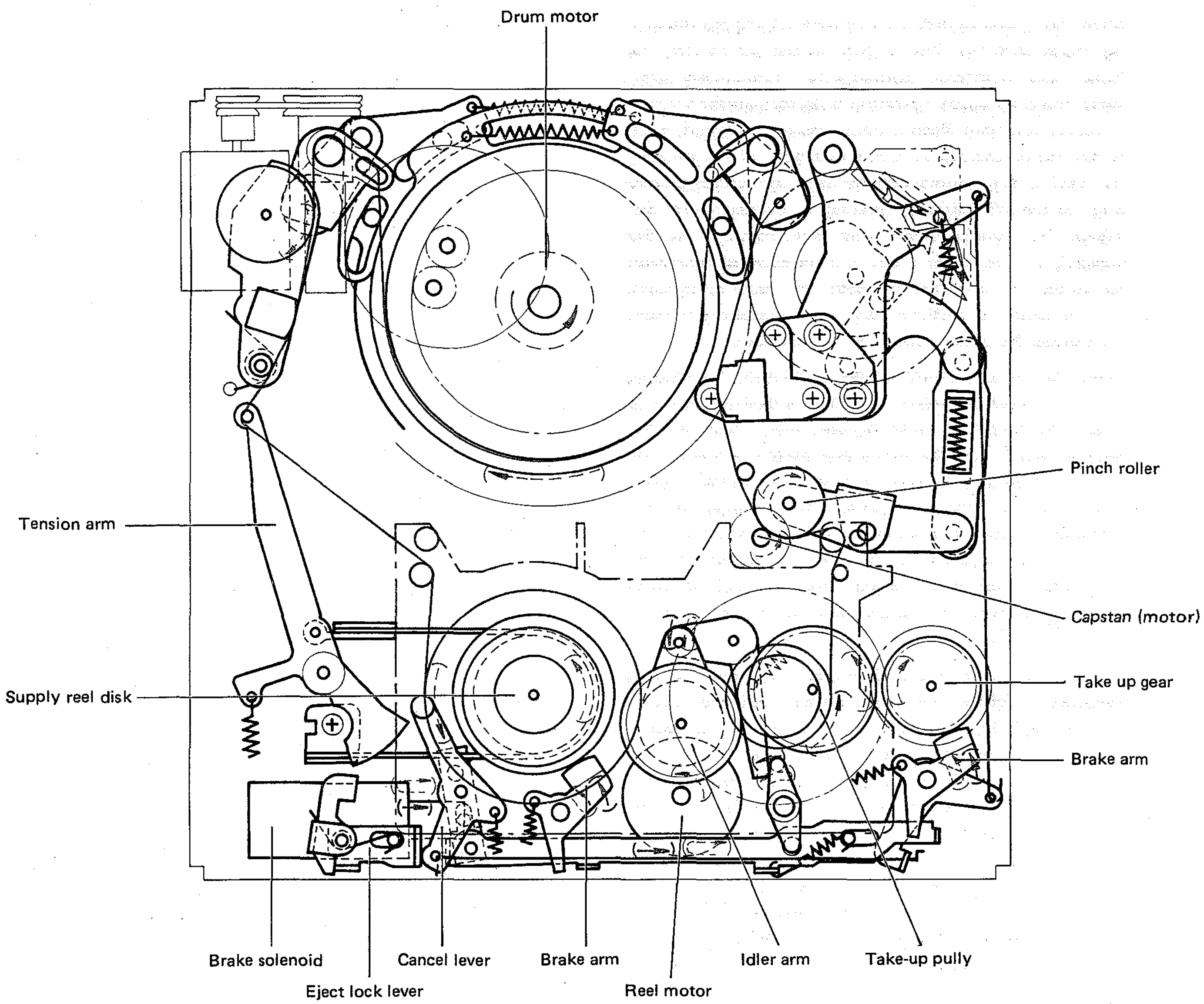
   In the Pause mode, the pinch roller remains engaged to the capstan and the tension arm is also in contact with the tape. Because the tape is stationary, the rotating video heads continue to trace the same portion of the tape. This would necessarily lead to increased tape wear if the same tape tension as during ordinary playback were maintained. Therefore, the tape tension is lowered by introducing a slight delay between the stop of the capstan motor and the operation of the brake arms through the brake solenoid OFF.

   When the PLAY button is pressed again, the brake solenoid becomes ON and the brake arms are released. The reel motor starts to rotate, bringing the idler arm into contact with the take-up pulley and thereby driving the take-up gear. The capstan motor also starts rotation and the tape transport is resumed with the tape being wound by the take-up gear as in the original Play mode.

2. Record Pause mode
   When the PAUSE button is pressed in the Record mode, the Pause mode is entered momentarily, but the brake solenoid becomes ON immediately afterwards, releasing the brake arms. At the same time, the reel motor turns counterclockwise, bringing the idler arm into contact with the supply reel disk to transmit the motor rotation.

   The capstan motor also turns counterclockwise, pulling the tape from the take-up reel and transporting it towards the drum side. The tape passes the drum and transport system in reverse and is wound onto the supply reel. This back-spacing operation is performed for approx. 1 second. Then the brake solenoid beocmes OFF and the reel motor stops, thereby stopping the tape transport and activating the reel brakes. The capstan motor also stops turning with a short delay after the brake solenoid became OFF to ease the tape tension and reduce tape wear.

   When the PLAY switch is pressed, the brake solenoid becomes ON and the brake arms are released. The reel motor starts to rotate clockwise, bringing the idler arm into contact with the take-up pulley and thereby driving the take-up gear. The capstan motor also starts clockwise rotation and the tape transport is resumed. The Play mode is entered with the tape being forwarded by the capstan and wound onto the take-up reel by the take-up gear.


Drum motor
Pinch roller
Tension arm
Capstan (motor)
Take up gear
Supply reel disk
Brake arm
Brake solenoid
Cancel lever
Brake arm
Idler arm
Take-up pully
Eject lock lever
Reel motor

(→) Shift from play to play pause mode
(⇢) Shift from play pause to REC pause mode
→ Play pause and REC pause operation

Fig. 2-7

.2.7 REC Lock Power-off mode

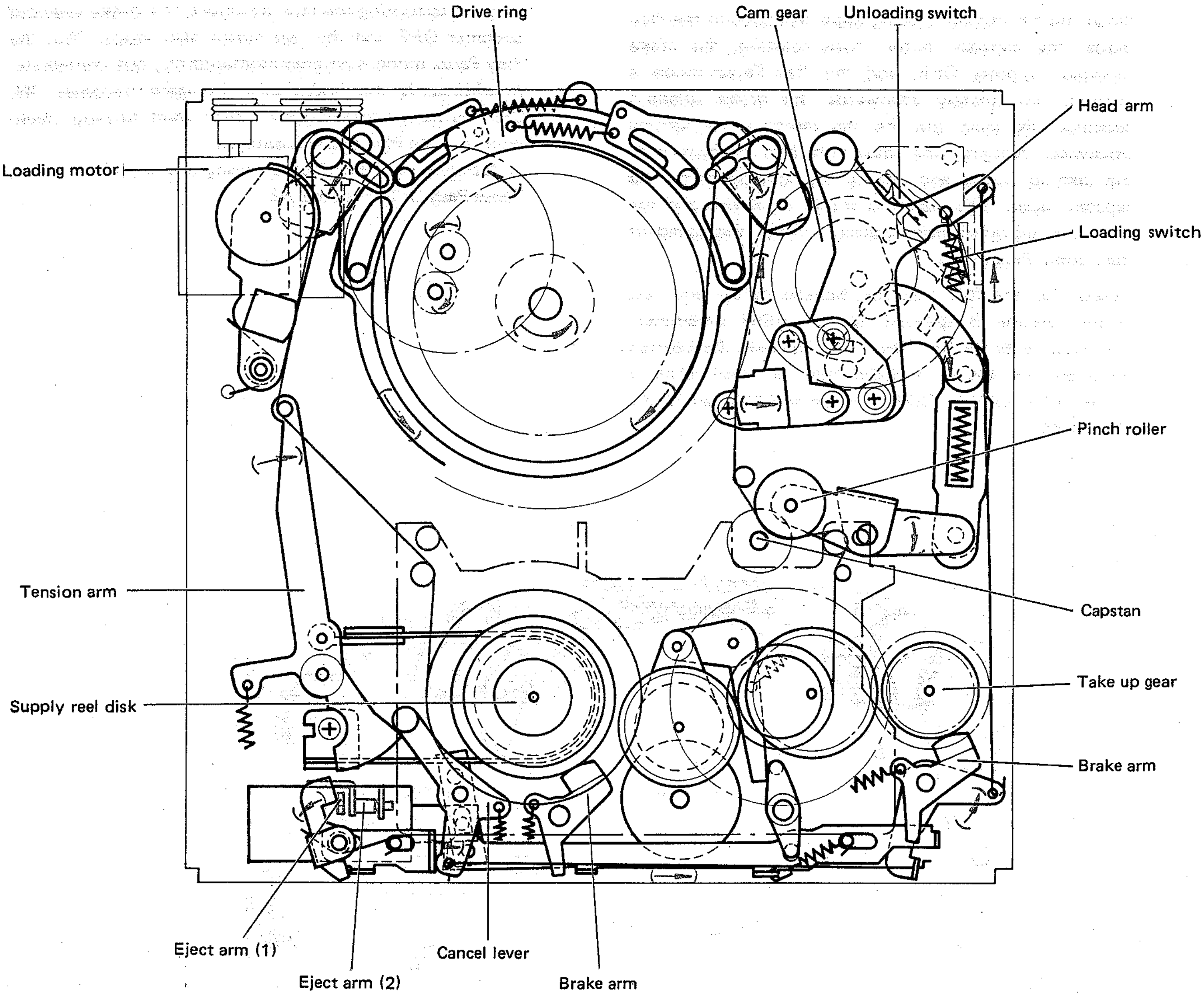
When the power switch is set to OFF during the Recording mode with the REC LOCK switch set to ON, the Pause mode is entered momentarily. Immediately afterwards the back-space operation is performed for approx. 1 second and then Record Pause mode is entered. Even in this mode, the power is not switched off yet, because the REC LOCK switch will be used for comparatively long switch-off periods, making it necessary to disengage the pinch roller from the capstan. As the engaging of the pinch roller is a mechanical operation performed in conjunction with the loading process, it is necessary to perform very brief unloading in order to separate the pinch roller from the capstan.

When the Record Pause mode is entered, the loading motor immediately starts to rotate, activating the drive rings. The drive ring turns the cam gear, which sets the loading switch and the unloading switch to OFF. The cam gear continues to turn, and when it sets the loading switch to ON again, the loading motor stops and the unloading action is terminated. At the same time, the drum motor stops and the power is switched off. The unloading action in this process does not include winding the tape onto the supply reel, so as not to disturb the editing point.

In the REC Lock Power-off mode, the pinch roller is disengaged slightly from the capstan, but the tape is held in place because the brake arms act on the supply reel disk and the take-up gear. Due to the brief unloading action, the head arm has also turned a little counterclockwise. This has released the cancel lever in the counterclockwise direction, thereby disabling the eject lock although the brake solenoid has become OFF. This might be thought to place the tape in danger of being damaged by raising of the cassette housing, but actually a section of the tension arm blocks the eject arm (2) in the cassette housing and prevents ejecting of the cassette.

When the power is switched on again, the loading motor starts to operate, causing loading to be performed, after which the Record Pause mode is entered.

When a camera is connected, the Record Pause mode is maintained in this condition. When no camera is connected, the Record mode is entered after 3 seconds. The drum motor starts to rotate immediately when the power is switched on.


Drive ring
Cam gear
Unloading switch
Head arm
Loading motor
Loading switch
Pinch roller
Capstan
Tension arm
Take up gear
Supply reel disk
Brake arm
Eject arm (1)
Cancel lever
Eject arm (2)
Brake arm

(→) Shift from REC pause to REC lock power-off mode

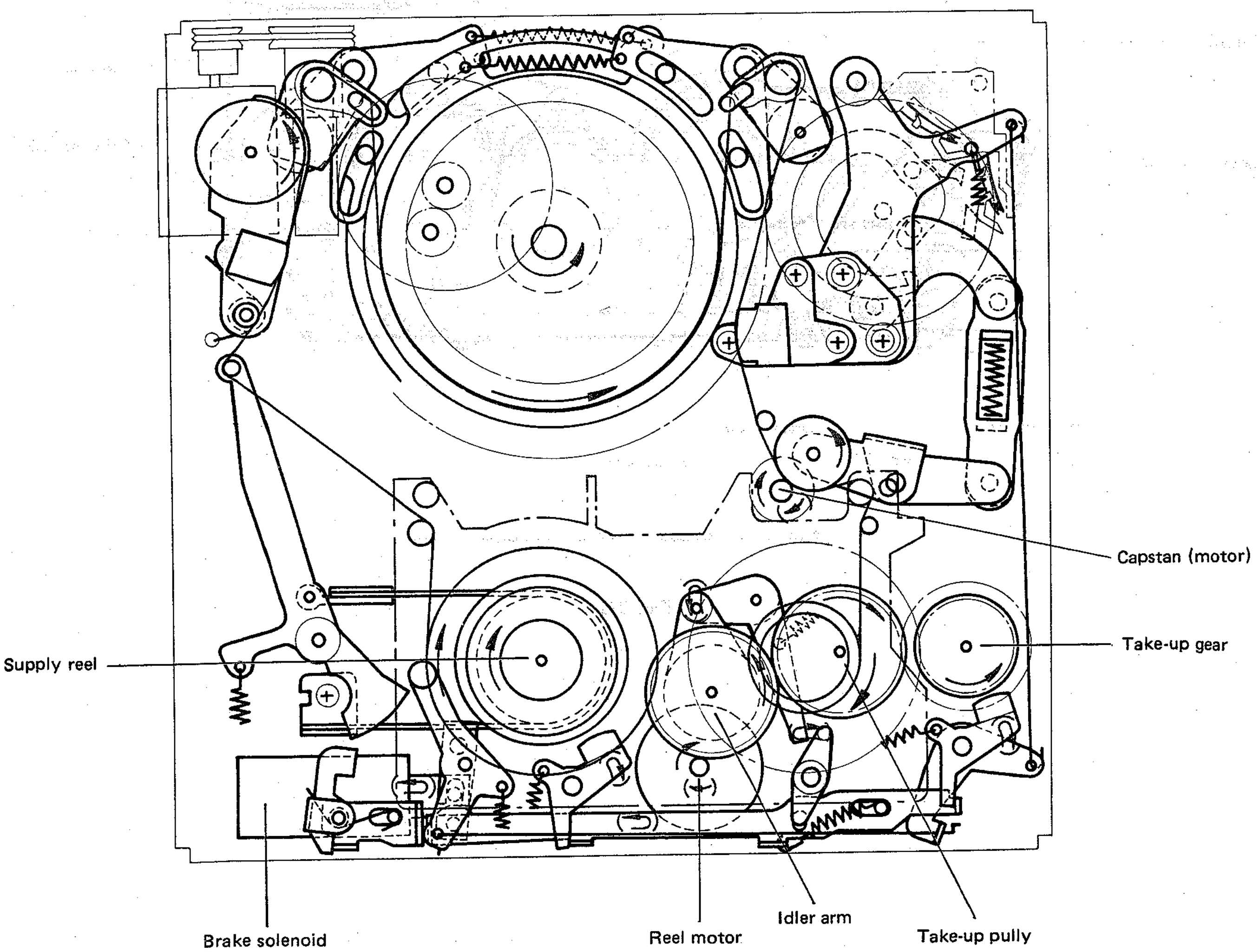
Fig. 2-8

.2.8 Search FF mode

When the FF button is being kept depressed in the Play mode, the capstan motor stops rotating, the brake solenoid becomes OFF, and the Play Pause mode is entered. Immediately afterwards the brake solenoid becomes ON again and the reel motor starts turning clockwise, bringing the idler arm into contact with the take-up pulley and driving the take-up gear. The capstan motor also starts to rotate clockwise and the tape is transported with approx. 3 times the speed of the normal Play mode.

Except for the fact that the capstan motor and reel motor rotation is speeded up, the other parameters are the same as for the Play mode. Because the capstan forwards the tape at a higher rate, the reel motor is driven with approx. double voltage as compared to the Play mode.

When the FF button is released, the capstan motor stops, interrupting the tape transport, the brake solenoid becomes OFF and the reel motor also stops. Thus the Play Pause mode is entered momentarily, but immediately afterwards the brake solenoid again becomes ON, the reel motor and capstan motor start turning clockwise, and the Play mode is entered.
If the tape end is detected during Search FF, the Play Pause Pause mode is entered.



(→) Shift from play to Search FF mode
→ Search FF mode operation

Fig. 2-9

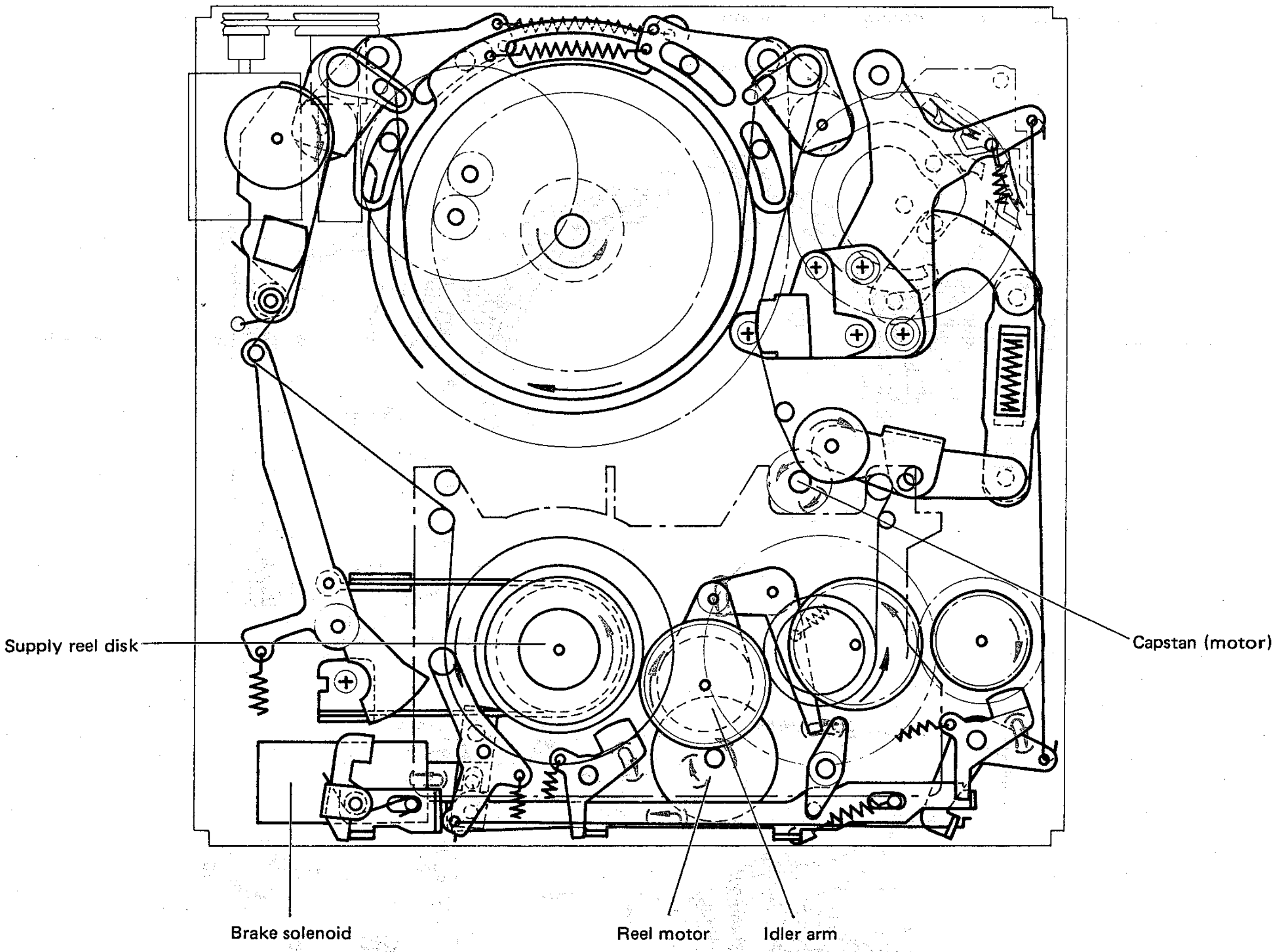
2.2.9 Search Rewind mode

When the REW button is being kept depressed in the Play mode, the capstan motor stops rotating, the brake solenoid becomes OFF, and the Play Pause mode is entered. Immediately afterwards the brake solenoid becomes ON again and the reel motor starts turning counterclockwise, drivning the supply reel disk via the idler arm. The capstan motor also starts to rotate counterclockwise and the tape is transported in reverse with approx. 3 times the speed of the normal Play mode.

Whereas in the Search FF mode the tape can be directly wound onto the take-up reel, in the Search Rewind mode it must be pulled past the drum and transport system in reverse and wound onto the supply reel. As this presents a greater load, the drive voltage of the reel motor is set to a still higher value than in Search FF.

When the REW button is released, the Play Pause mode is entered momentarily, and then the original Play mode is resumed.

If the tape end is detected during Search Rewind, the Play Pause mode is entered.

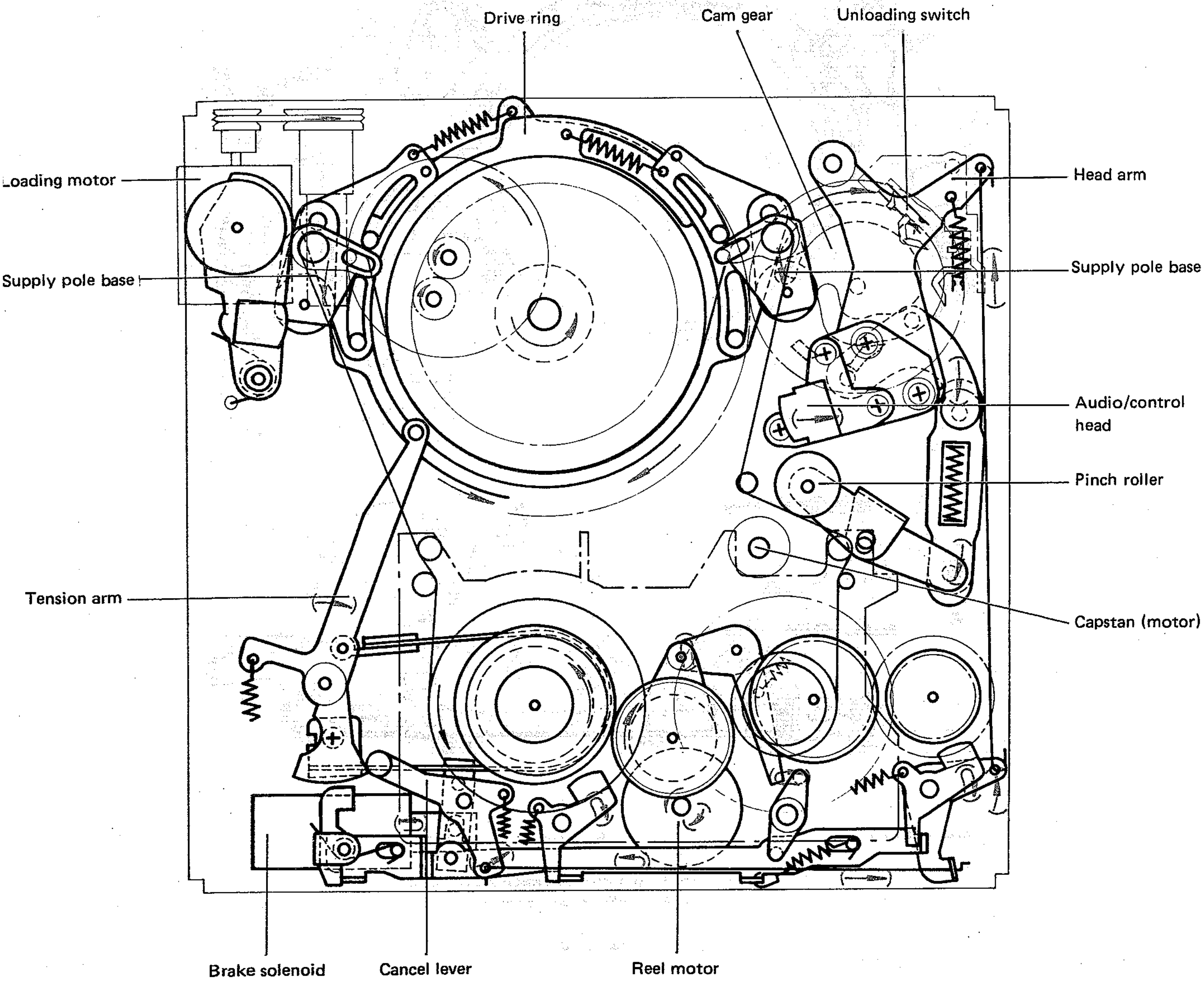


(→) Shift from Play to Search REW mode
→ Search REW mode operation

Fig. 2-10

:.2.10 Unloading mode

When the Stop button is pressed or the tape end is detected in the Play mode, the capstan motor stops, halting the tape transport. The reel motor also stops and the brake solenoid becomes OFF. After approx. 0.5 seconds the brake solenoid again becomes ON and the reel motor and loading motor start rotating. The loading motor activates the drive rings, starting to move the pole bases towards the cassette. The reel motor turns counterclockwise, turning the supply reel disk via the idler arm and winding the tape onto the supply reel. The cam gear driven by the drive ring releases the head arm in the counterclockwise direction and the pinch roller in the clockwise direction. Prompted by the revolution of the head arm, the cancel lever turns counterclockwise while pushing the tension arm. Afterwards the head arm swings the autio/control head to a position where it does not interfere with the movement of the take-up pole base. The cancel lever also removes the tension arm sufficiently from the tape. Finally the supply pole base – while pushing the tension arm – and the take-up pole base retract into the cassette. At this point, the cam gear driven by the drive ring depresses the unloading switch, setting it to ON. At the same time, the loading motor and the reel motor stop. The brake solenoid also becomes OFF, but after approx. 0.5 seconds it becomes ON again. The drum motor now stops and short Rewind is performed for approx. 0.2 seconds. Then the Stop mode is entered.


Drive ring
Cam gear
Unloading switch
Loading motor
Head arm
Supply pole base
Supply pole base
Audio/control head
Pinch roller
Tension arm
Capstan (motor)
Brake solenoid
Cancel lever
Reel motor

(→) Shift from Play to Unloading mode
→ Unloading mode operation

Fig. 2-11

SECTION 3
CIRCUIT DESCRIPTION

3.1 MECHANISM CONTROL CIRCUIT

3.1.1 Microprocessor HD44820

The mechanism control (mechacon) circuit includes a one-chip microprocessor (HD44820). Due to space limitations, input and output data expansion techniques are not employed and the 54-pin microprocessor alone is used for controlling the mechacon circuit.

Description of HD44820 4-bit microprocessor
Signle-chip 4-bit microprocessor 54 pins CMOS
Power supply voltage : 5 V
Power consumption : 0.8 mA
Clock frequency : 400 kHz

1. Input terminal configuration
   1) Input pins 36 and 37
   2) Without pull-up MOS
   3) Input

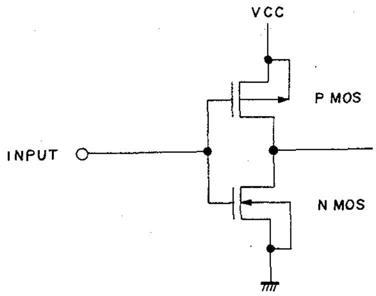

VCC
P MOS
INPUT
N MOS

Fig. 3-1

2. Output terminal configuration
   1) Output pins 46 to 49
      CMOS output
      Output

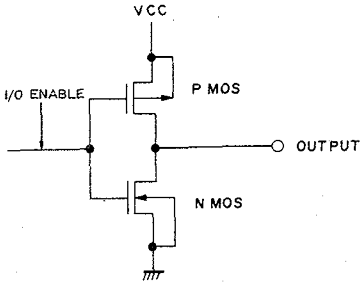

VCC
I/O ENABLE
P MOS
OUTPUT
N MOS

Fig. 3-2

   2) Pins 50 to 53 and 44
      Open-drani output
      Output

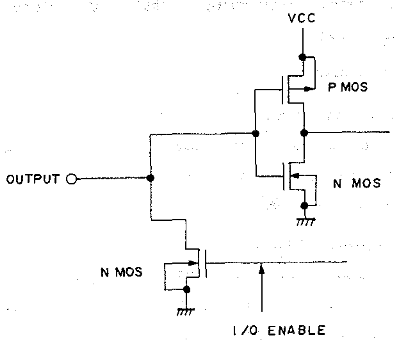

VCC
P MOS
OUTPUT
N MOS
N MOS
I/O ENABLE

Fig. 3-3

   3) Pins 1 to 5
      Pins 13 to 16
      Open-drain, with pull-up MOS
      Output

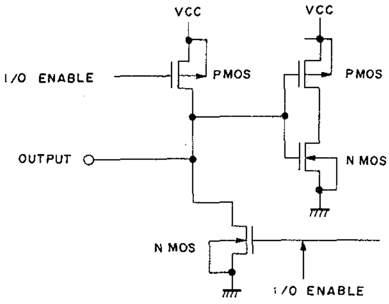

VCC
VCC
I/O ENABLE
PMOS
PMOS
OUTPUT
N MOS
N MOS
I/O ENABLE

Fig. 3-4

   4) Pins 6 to 12, 17 to 20, 28 to 35, 38 to 43 and 45
      Output

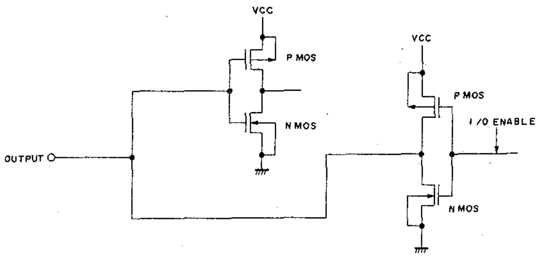

VCC
P MOS
N MOS
VCC
P MOS
I/O ENABLE
OUTPUT
N MOS

Fig. 3-5

   5) Pin 26 : Normally high potential, low during test.
      Pin 21 : High potential at reset, low potential during operation.

.1.2 Block diagram description

As can be noted from the block diagram, circuit composition is simpler than earlier mechacon systems. IC1 is a 54-pin microprocessor and, in absence of expander circuits, input and output data are applied directly.

Output data are employed for controlling the reel, loading, capstan and drum motors, and the brake solenoid. Control is also performed for the audio muting, audio dub, audio recording, video E-E, video recording and other circuits.

- Circuit Functions

1. Reset pulse generator (IC2)
   This performs initial reset for the microprocessor. Normally low potential, reset is performed by a high pulse of more than 400 msec.
2. Reel speed control (RA1)
   4-bit data from the CPU are applied to resistor array RA1, which produces a 15-step voltage variation for controlling the reel motor speed.
3. Key scan circuit (IC3, RA2 and RA3)
   The same ladder principle is used for the inputs from both the mainframe and remote control unit operating buttons. The 5 V power supply voltage results in a voltage variation of approximately 0.3 V per step.
4. Tape counter
   A special IC is employed for the tape counter and remaining time indication. Approximataly 1 hour back-up is provided by C3 (0.1 μF).

3.1.3 Circuit operations

1. Power on/off control
   Power can be switched on and off from the mainframe POWER button, the remore control unit, or a connected camera. The power on/off operation is performed by latching relay RY1 of the servo board. Fig. 3-6 illustrates the relay drive circuit.

(1) Power on operation

Pressing the POWER button (S9) switches Q18 and Q19 on. During the initial power on operation, although the power on signal is sent to IC7, regulated 5 V is not supplied. Therefore, IC7 and IC1 do not operate.

A CR circuit differentiates the power on signal, which is then supplied to Q12. This transistor switches on only during the negative pulse interval, at which time, Q13 switches on. Current then flows in the RY1 coil, switching the relay on and supplying unregulated 12 V to the circuits.

Similarly, a power on signal supplied via pin 4 of the camera connector is differentiated and sent to Q11 and Q13, thus activating the relay.

Separate circuits are used for the power on functions of the camera and mainframe, since with some camera models, the pin 4 is grounded. Therefore, the separate circuits prevent disabling of the mainframe power function if this type of camera is connected.

The power on signal is supplied by the following methods:

1) Mainframe POWER button (S9) set to on,
2) Power button of remote control unit depressed,
3) Camera power switch set to on (when camera model is equipped with this feature).

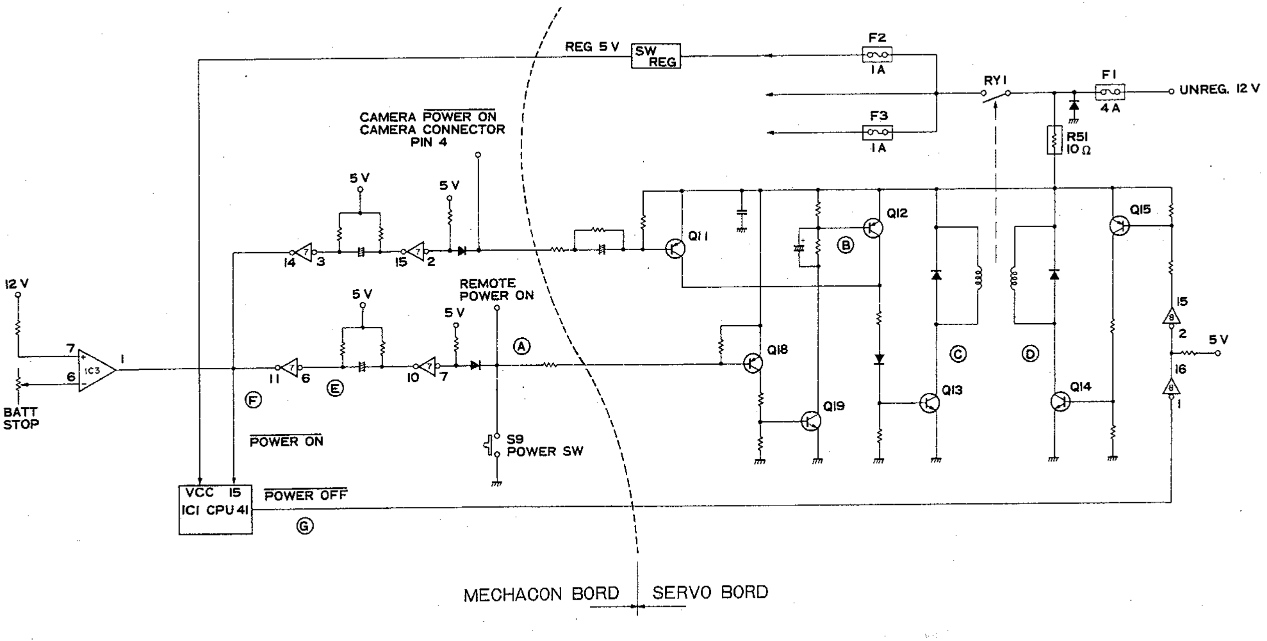


Fig. 3-6

Latching relay RY1 retains its previously driven on or off state. Consequently, if the battery power is disconnected, then reconnected, the mainframe remains in the power on mode.

(2) Power off operation
While the power is on, again pressing the POWER button initiates the power off operation. A negative pulse from IC7 pin 10 is differentiated and applied to pin 6 of IC7. The negative pulse for power off control then goes from IC7 pin 11 to IC1 pin 15. By this, the IC microprocessor detects pressing of the POWER button and, after a 100 msec delay, issues the power off command from pin 41. The delay serves for audio muting and avoid noise.

If recording or playback is in progress, unloading is first performed and the Stop mode entered. Then after 100 msec delay, the power off command is issued.

Similarly, power off from the 10-pin camera connector or remote control unit is initiated by applying the signal to IC1 pin 15.

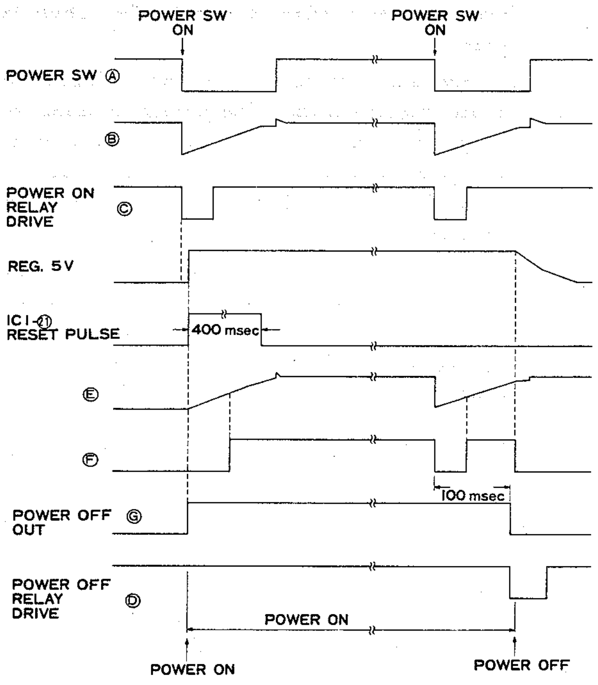


Fig. 3-7

(3) Battery depletion
During battery operation, the power off function is also triggered when the battery voltage declines below a certain value. Unregulated 12 V goes to pin 6 of IC3, which serves as a comparator for monitoring the battery voltage.

As long as the battery voltage exceeds 10.3 V, IC3 output remains at high potential. However, when the battery voltage drops below 10.3 V, the comparator output reverses to low potential. The resulting negative pulse is detected by IC1, which sends the power off command from pin 41.

2. Reset pulse generator (IC2)
The initial reset pulse for the microprocessor is generated by this circuit. At power on, regulated 5 V is divided by R79 and R81 to supply approximately 2.5 V to pin 5 of IC2. Simultaneously, IC2 pin 6 begins charging at the time constant of R78 and C7.

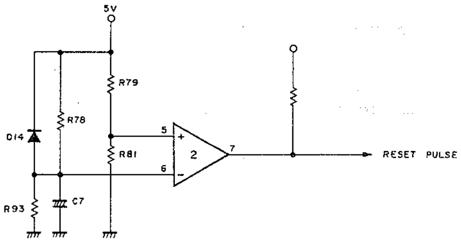


Fig. 3-8

High voltage thus appears at IC2 pin 5 at power on and the output is also high potential. After approximately 400 msec, pin 6 becomes fully charged and the output drops to low potential. The reset pulse is therefore generated for about 400 msec after power on.

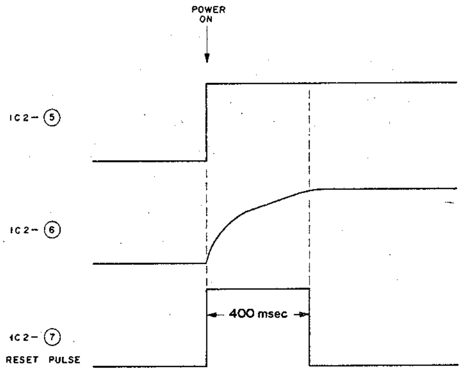


Fig. 3-9

3. Key scan circuit
Data outputs for key scan appear at IC1 pins 17 to 20. These are in the form of 4-bit BCD (binary coded decimal) data for key scan 0 to 3 and go to RA3. Resistor array RA3 operates as a digital to analog (D/A) converter and produces a 15-step DC voltage output from the 4-bit data. Each step corresponds to a variation of 0.3 V, which goes to IC3 comparator.

Operating a control button applies a DC voltage to the other input of the comparator. The output of the comparator is sent as a negative pulse with width determined by the respective control button to IC1 pin 15. By detecting the width of the pulse, the microprocessor determines which button has been pressed.

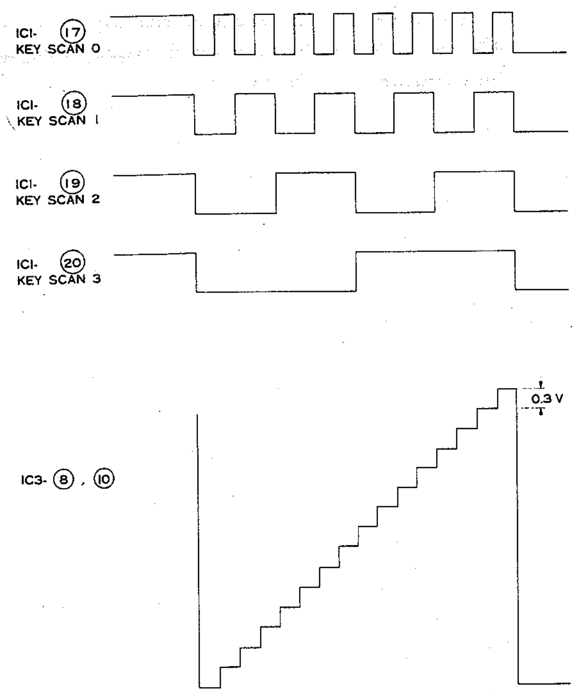


Fig. 3-10

The circuit power supply of 5 V results in a voltage change of 0.3 V per step. In order to avoid erroneous operation, the data are polled 10 times (usually 2 times with full size decks) and a selected mode is entered only after the same data are obtained 10 times. Each polling cycle requires from 2 to 5 msec, resulting in a total delay of about 60 msec, which presents no problem in practical operation.

4. Loading motor operation
   Loading motor control is obtained from pins 34 and 35 of IC1, and applied to IC301 of the servo circuit. Mechacon IC1 detects the states of the loading and unloading switches, and controls the loading motor.

(1) Loading and unloading switches
In the Stop mode, the unloading switch is on and the loading switch is off. When loading starts, the unloading switch state changes from on to off, and just prior to completion of loading, the loading switch becomes on. At this point, the mechacon circuit detects the end sensor state. Since a cassette lamp is absent, this function is performed by the tape end sensor. However, as the end sensor detects light in the Stop, FF and REW modes, this operation is defeated when tape is not loaded.

At this point, the capstan motor starts. When both loading and unloading switches are simultaneously on, the loading motor stops and the play mode is entered.

(2) REC LOCK switch
With the REC LOCK switch engaged, when power is switched off, the back space operation is performed. After the pinch roller disengages, the power becomes cutoff.

At completion of back space, the mechacon instructs reverse rotation of the loading motor in order to release the pinch roller. Reverse rotation continues until the loading switch becomes on, the rotation stops and power is cutoff. The tape remains loaded and the pinch roller released.

In this state, when power is returned, the loading switch is initially off and the loading motor rotates in the forward direction. When the pinch roller is fully engaged, the loading switch becomes on and the REC Pause mode is entered.

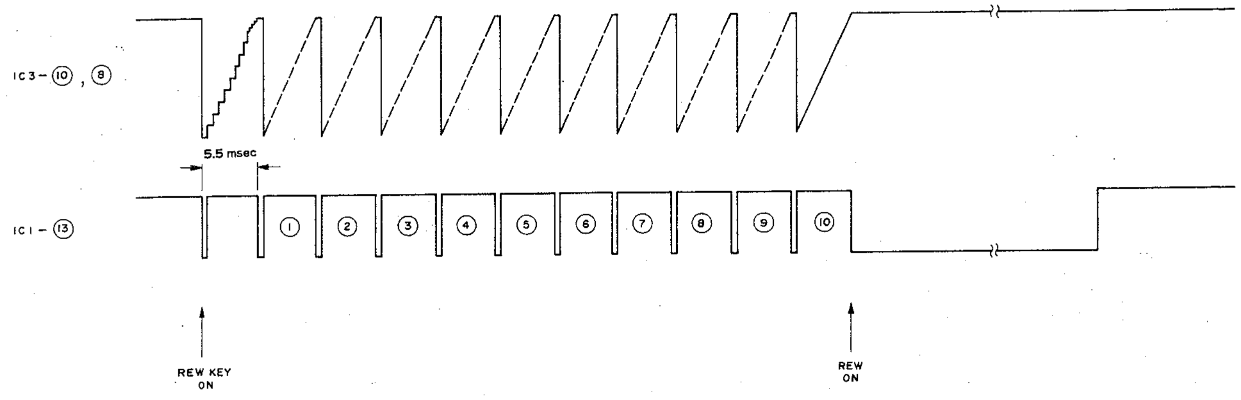
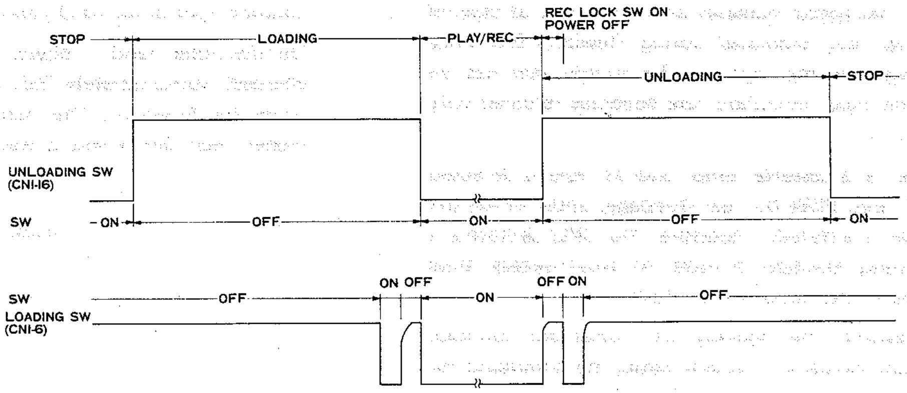


Fig. 3-11



	STOP	LOADING	LOADING END	REC LOCK ON POWER OFF
UNLOADING SW	Low	High	Low	High
LOADING SW	High	High	Low	Low

Fig. 3-12

5. Reel motor speed control

Reel motor rotation is controlled by 4-bit data from IC1 pins 28 to 31. RA1 converts the digital data to analog form, and the speed control output is supplied via the servo circuit to the switching regulator. In accordance with the 4-bit data, the voltage from RA1 is in 15 steps, resulting in 0.3 V DC per step. The approximately doubled DC voltage from the switching regulator goes to reel motor drive IC302.

In addition to speed, the forward/reverse direction signal from the mechacon circuit is also applied to IC302.

In modes other than Fast-forward and Rewind, the reel motor is controlled for a fixed speed. Setting data are supplied by the CPU for each mode. Since low voltage is supplied only in the Play mode, D19 switches on and R41 (REEL MOTOR) adjusts the voltage for play speed.

During FF and REW, the CPU monitors reel rotation and performs reel motor speed control. As indicated in Fig. 3-13, since reel rotation is slow at the start of Rewind, the CPU increases the output voltage in steps from 1 to nearly maximum at about 4.8 V. Reel motor speed increases quickly and, as the diameter of the tape remaining on the take-up reel becomes smaller, the reel rotation increases.

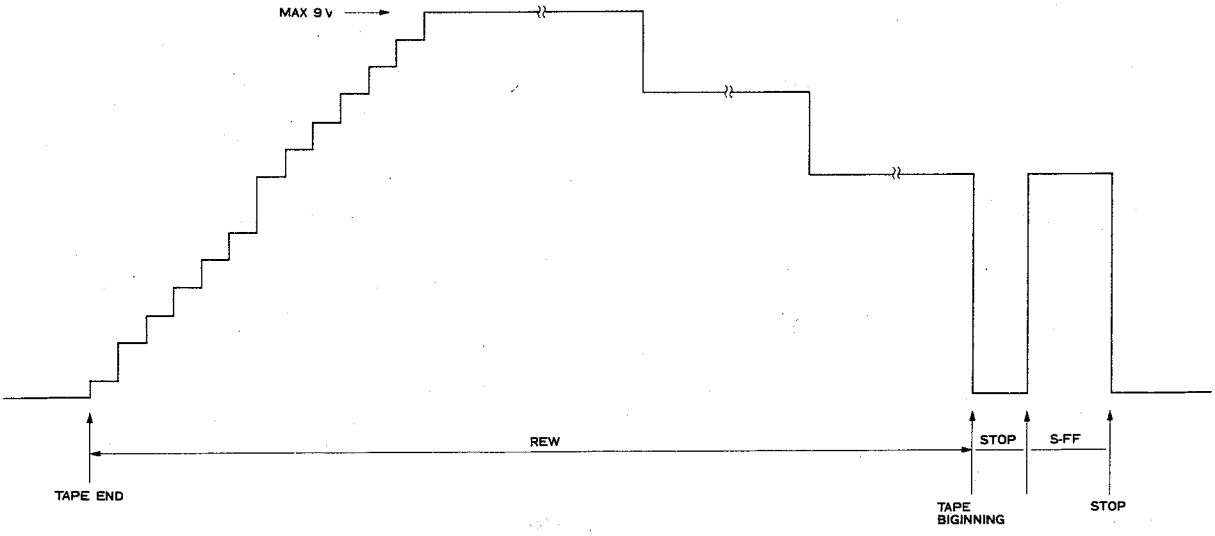


Fig. 3-13

The CPU detects the reel pulse at pins 3 and 4, and controls the rotation according to the load. As shown in Fig. 3-14, reel speed increases as the amount of tape on the take-up reel decreases during Rewind. But since the diameter of the tape on the supply reel has increased, the tape rewinding rate becomes reduced only minimally.

In absence of a cassette lamp, end of tape is detected during FF and REW by reel stoppage, upon which the Stop mode is entered. Therefore, the CPU performs a speed limiting function in order to avoid excess stress on the tape at the end of FF or REW.

During Rewind, the take-up reel pulses are counted. If the count exceeds a certain value, the command for reduced speed is issued. In the Fast Forward mode, the supply reel pulses are counted to perform control.

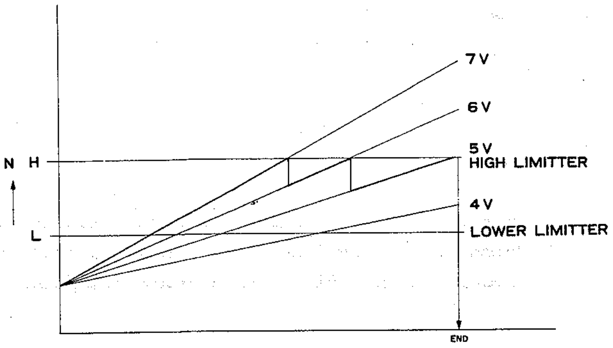


Fig. 3-14

6. Counter reset pulse generator
   Capacitor C5 provides approximately 60 minutes backup. If the power is switched on while C5 is descharged, approximately 3 V goes to comparator IC4 pin 3. At the same time, a steadily rising potential (R54 and C4 time constant) is applied to IC4 pin 2.

Consequently, an approximately 50 msec positive pulse is obtained from IC4 pin 1, which functions as the counter reset pulse via Q1 and Q2.

On the other hand, if power is switched on while C5 is charged, approximately 3.5 V is supplied to IC4 pin 2 from the capacitor. This maintains the pin 2 potential higher than pin 3 and prevents the reset pulse output.

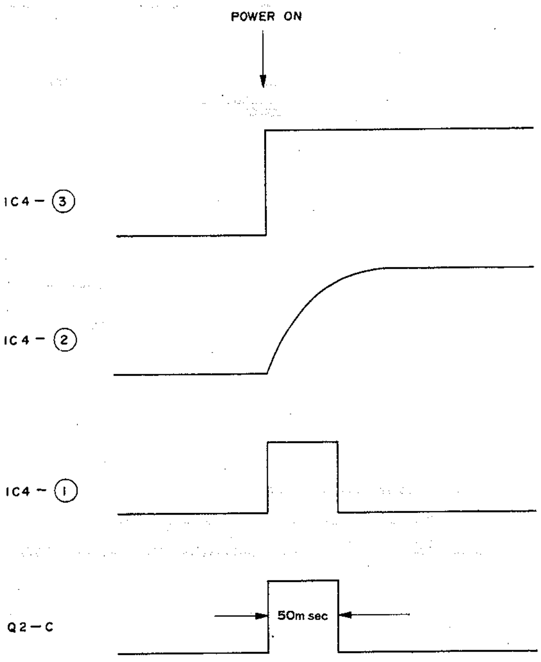


Fig. 3-16

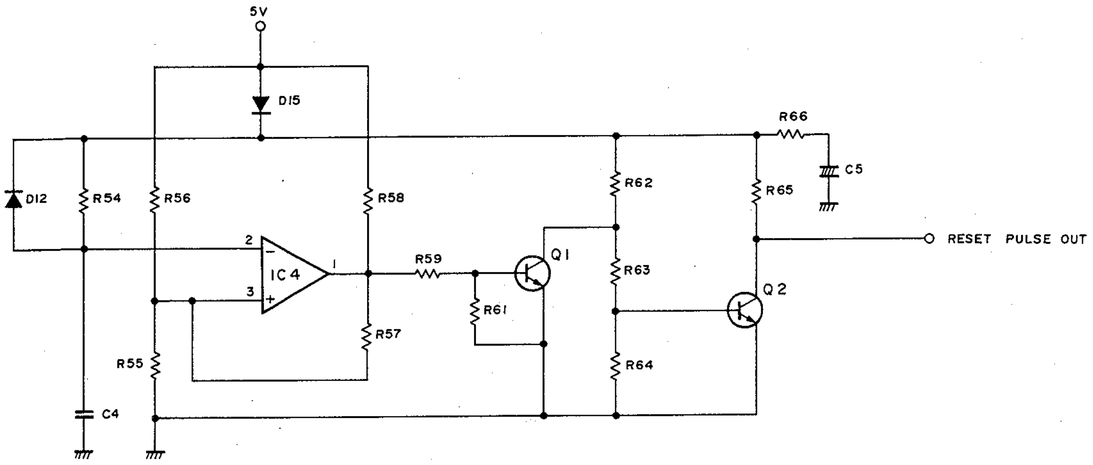


Fig. 3-15

3.1.4 Back space editing

In the Recording mode, pressing the PAUSE button stops the tape after a short over-run. This over-run (α) is stored in the microprocessor by counting the capstan FG (360 Hz) pulses. The capstan motor turns in reverse to transport the tape in reverse direction by the amount equivalent to 360 FG pulses + α. A slight over-run also occurs in reverse and this is again stored in the memory. The Pause mode is then entered.

When the PLAY button is pressed in this state, playback becomes performed for 324 FG pulses (0.9 sec) + α, then the Recording mode is resumed. This results in approximately 0.1 sec overlap.

Similarly, if power is switched off with the REC LOCK switch engaged, after back-space and pinch roller release, the power becomes cutoff. When power is returned, the pinch roller engages and the Pause mode is entered. At this time, pressing the PLAY button initiates the above editing function.

With this model, the Pause mode is held for 3 seconds after back-spacing. Therefore, even though the PLAY button may be pressed during back-space, Pause continues and Recording becomes resumed three seconds later.

Since back-preview operation is performed, the servo circuit becomes set to the playback mode (crystal locked). After entering Pause, this is changed to the sync component of the input video signal. The Mechacon CPU therefore holds the Pause mode for 3 seconds in order to allow time for drum servo synchronization.

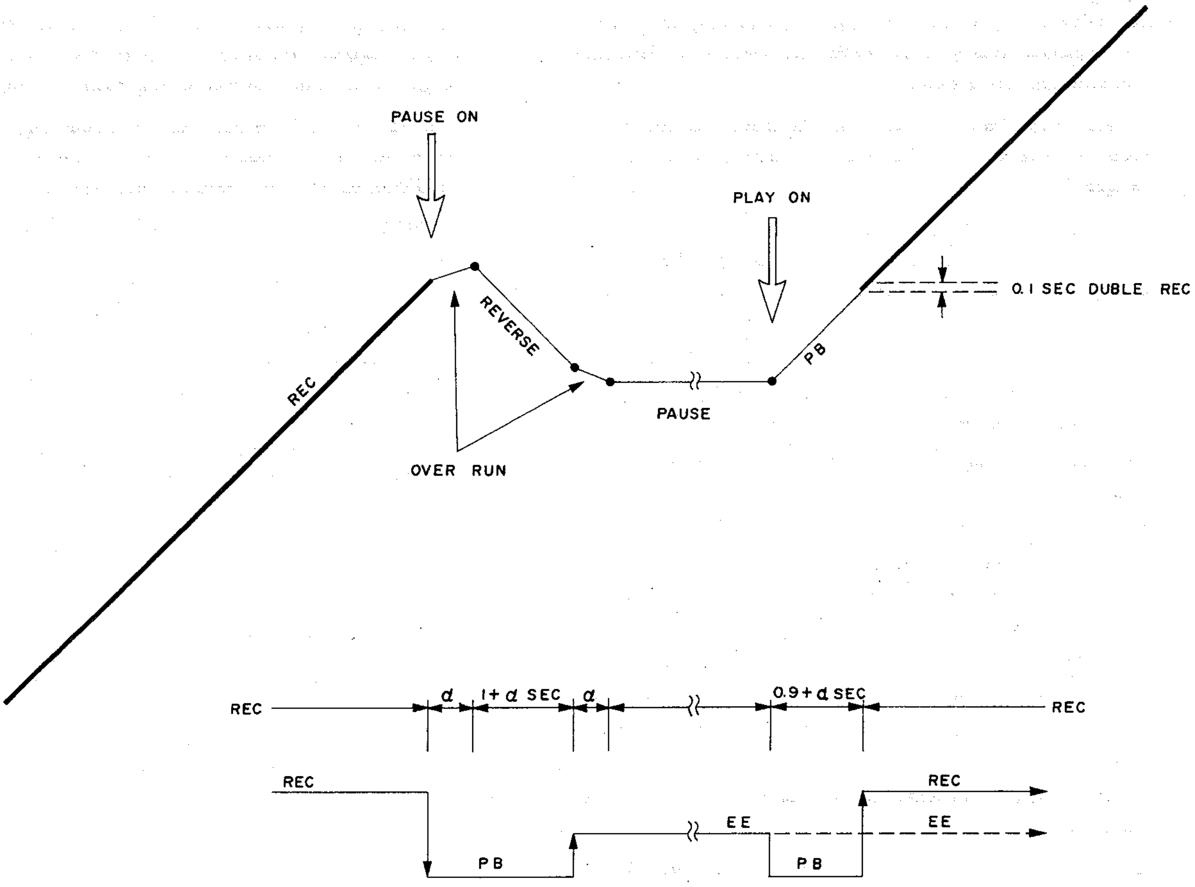


Fig. 3-17

.1.5 Mechacon operation checkpoints

1. Observe that power on is correctly performed from the POWER switches of the mainframe, remote control unit and camera control. After power on, the STOP LED lights and auto-rewind is performed for 0.2 sec in order to avoid tape slack. At this time, the video output signal is E-E.
2. When a cassette is loaded into the cassette housing, the cassette switch becomes on and auto-rewind is performed for one second. During this time, the REW LED flashes. Since this model does not include a cassette lamp, it is possible to load a cassette which is at the end of tape. Therefore, automatic rewind is performed for one second when the cassette switch becomes on. Operation is inhibited when the cassette switch is off.
3. At the beginning of the tape in the Rewind mode, FF is performed automatically for 1 second. Conversely, at the end of the tape during FF, Rewind is performed for 1 second.

   During auto FF, the FF LED flashes, while the STOP and REW buttons are inhibited. Conversely, the REW LED flashes during auto REW and only the Rewind command can be entered.

   FF and REW can be switched directly, but the Stop mode is entered for 0.5 sec between tape direction changes.
4. From the Stop mode, when the Play mode is selected, the E-E mode is entered during loading. The Play mode becomes selected one second after completion of loading.
5. At the end of tape during Play. the Stop mode is entered. After completion of unloading, auto rewind is performed to the beginning of the tape.
6. The Play mode can be entered from Stop, REW, FF or unloading. From FF or REW, the Stop mode is entered for 0.5 sec before switching to Play.
7. In order to avoid accidental erasure, the PLAY button operation is inhibited while the REC LOCK switch is on.
8. During Play, pressing the FF or REW button yields the Search mode. When alternating between Play and Search, the Pause mode is entered for 0.5 sec between transitions.
9. If end of tape is detected in the Search mode, the Pause mode becomes entered.
10. Both REC and PLAY LEDs light during loading. At completion of loading, when the Recording mode is entered, the REC LED begins flashing at approximately 1 Hz.

    The REC LED lights continuously during Pause and back-space.

    At 1 minute before end of tape, the REC indication is modulated at 10 Hz during its 1 Hz period.
11. When the PAUSE button is pressed during recording, the capstan turns in reverse to rewind a one second portion of the tape. During this interval, both REC and PLAY LEDs light and the PAUSE LED flashes. The video and audio circuits are switched to the playback mode (back review).

    In the Pause mode, the PAUSE LED lights steadily and the video output is E-E.
12. During the return from the Pause to the Recording mode, the PAUSE LED extinguishes and recording resumes after 0.9 sec. The overlap portion is 2 to 3 frames. Recording start is synchronized to the drum flip-flop signal.
13. Power off operation is initiated either manually by switch selection, or automatically by low battery voltage or dew detection. When this occurs during recording with the REC LOCK switch ON, back space is performed and the Pause mode entered. A short unloading operation disengages the pinch roller (unloading switch off), then the power becomes cutoff.
14. By returning power in the REC LOCK Pause state, a short loading operation is performed to re-engage the pinch roller, then the Recording mode is resumed.
15. The PLAY LED flashes during unloading. If the FF or REW button is pressed during unloading, the respective LED flashes and the memory becomes set.
16. When the Stop mode is entered after unloading, FF or REW, auto rewind is performed for 0.2 sec. During this interval, all operations are inhibited.
17. Remaining tape time indication is provided during Play and Recording modes. While the remaining time is greater than five minutes, the display is in minutes (seconds indication remains at 00) with a flashing colon (about 1 Hz). At less than five minutes, both minutes and seconds indications decrement.

3.1.6 Auto stop operation

1. If the loading operation continues for more than 10 seconds, the auto stop operation becomes initiated. Unloading is performed and the Emergency mode entered.
2. Auto stop is triggered if the cassette switch becomes off during operation.
3. Dew detection initiates auto stop.
4. If the record safety switch becomes off during recording, the Stop mode is entered, and Recording and Audio Dub are inhibited.
5. Battery voltage decline to 10.3 ± 0.2 V triggers the auto stop and the power becomes cutoff.
6. Continuous operation of the Pause or Still mode triggers the auto stop operation. Unloading is performed and the power cutoff.
7. Continuation of the REC LOCK Pause mode for more than 5 minutes initiates auto stop. In this case, power becomes cutoff, but tape remins loaded.
8. If unloading continues for more than 10 seconds, the Emergency mode is entered.
9. With the POWE SAVE switch ON, continuation of the Stop mode for more than 5 minutes initiates auto power off.

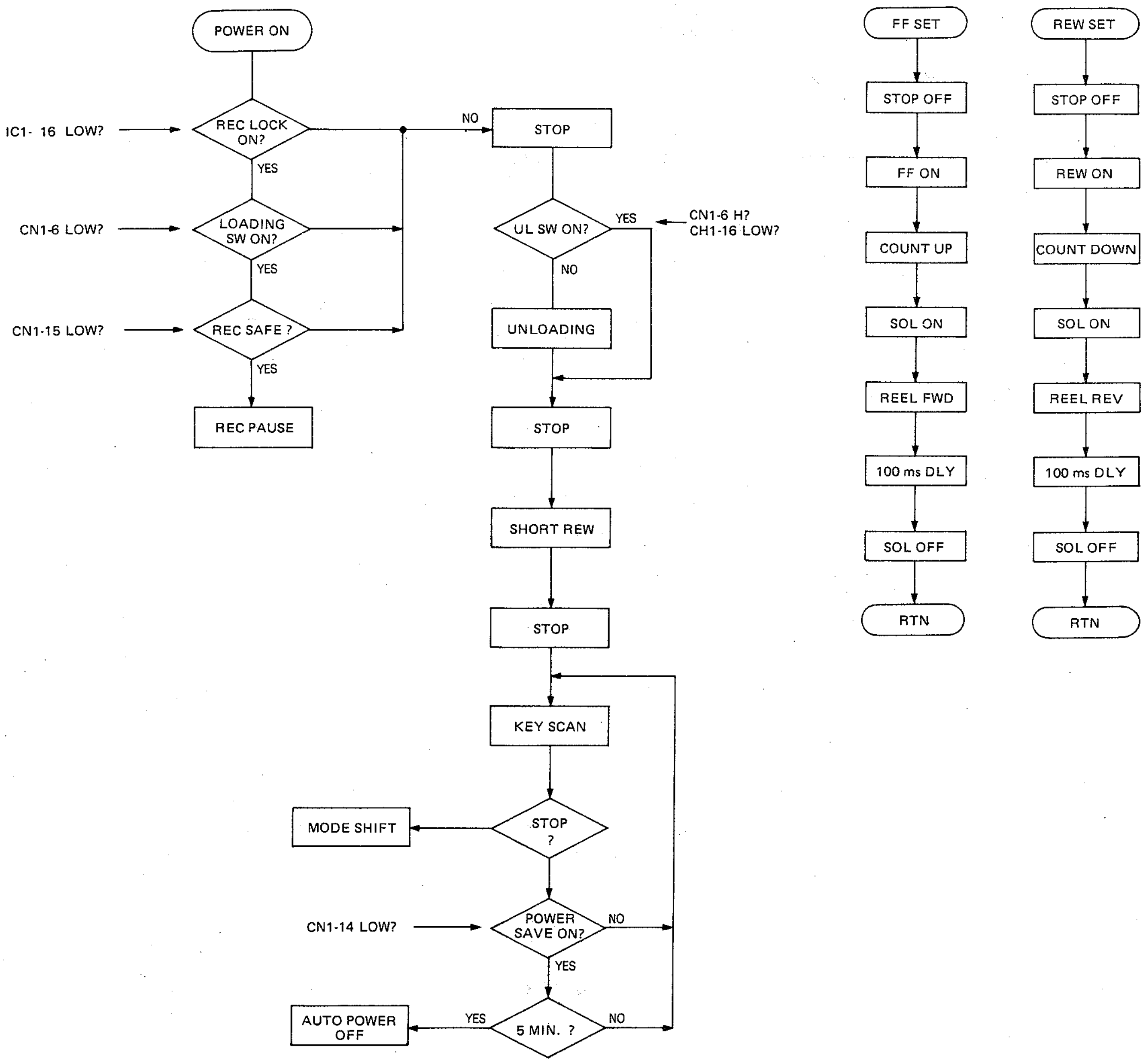

POWER ON
IC1- 16 LOW?
REC LOCK ON?
NO
STOP
YES
CN1-6 LOW?
LOADING SW ON?
UL SW ON?
YES
CN1-6 H?
CH1-16 LOW?
YES
NO
CN1-15 LOW?
REC SAFE ?
UNLOADING
YES
REC PAUSE
STOP
SHORT REW
STOP
KEY SCAN
MODE SHIFT
STOP ?
CN1-14 LOW?
POWER SAVE ON?
NO
YES
AUTO POWER OFF
YES
5 MIN. ?
NO
FF SET
STOP OFF
FF ON
COUNT UP
SOL ON
REEL FWD
100 ms DLY
SOL OFF
RTN
REW SET
STOP OFF
REW ON
COUNT DOWN
SOL ON
REEL REV
100 ms DLY
SOL OFF
RTN

Fig. 3-18

10. Continuation of the Emergency mode for more than 2.5 minutes initiates auto power off.

11. Auto power off is also activated in the following situations.
    1) Solenoid switch does not close after IC1 issues the solenoid drive pulse.
    2) Capstan FG pulse absent in modes when the capstan should be rotating.
    3) Drum flip-flop pulse absent in modes when the capstan should be rotating.
    4) Take-up reel disk rotation stops during tape transport.
    5) Capstan motor continues to turn in the Pause mode.
    6) Supply reel disk rotation stops during unloading.
    7) Loading or unloading continues for longer than 10 seconds.

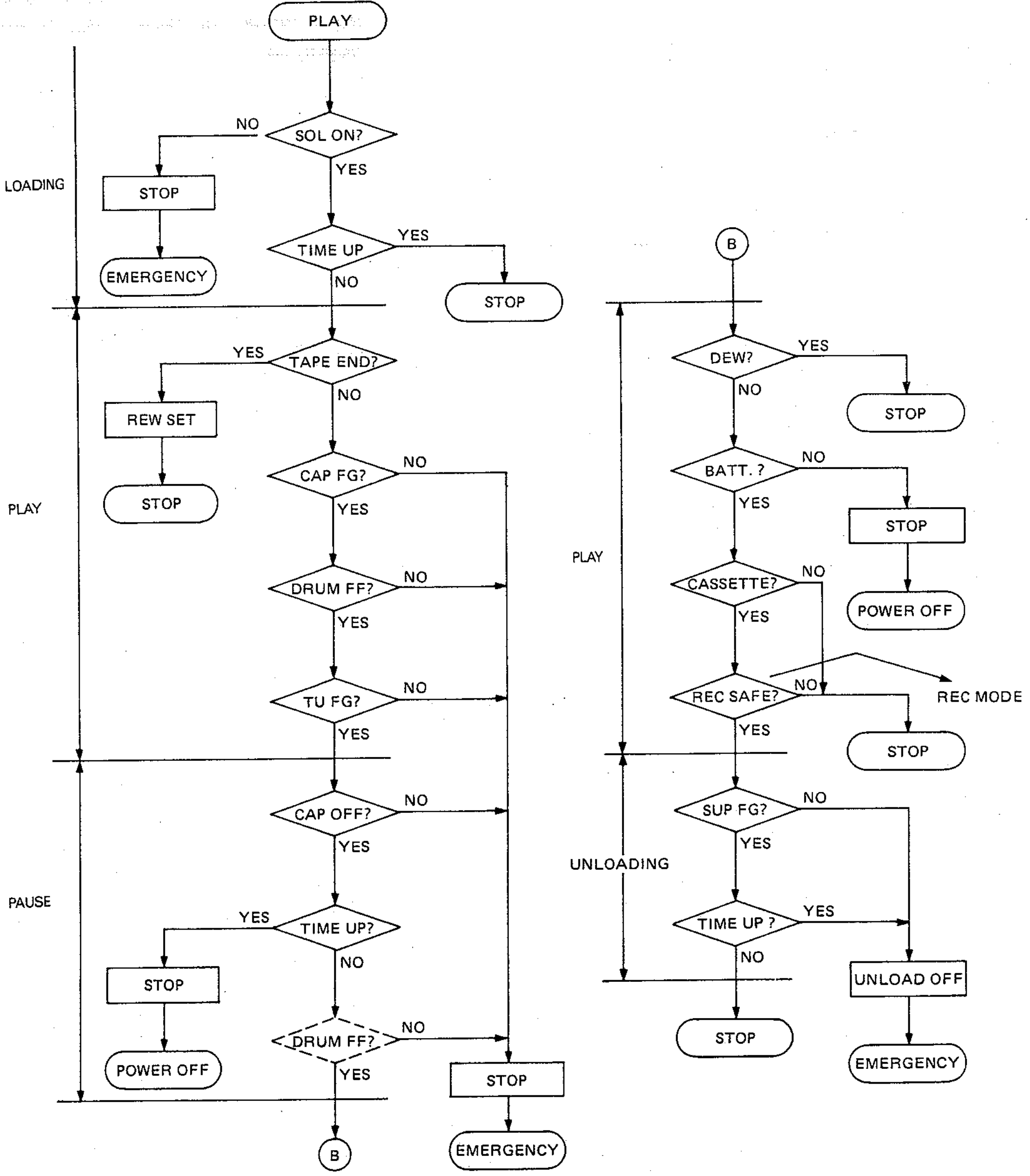

PLAY
LOADING
SOL ON?
NO
YES
STOP
EMERGENCY
TIME UP
YES
NO
STOP
PLAY
TAPE END?
YES
NO
REW SET
STOP
CAP FG?
DRUM FF?
TU FG?
PAUSE
CAP OFF?
TIME UP?
STOP
POWER OFF
DRUM FF?
STOP
EMERGENCY
B
DEW?
STOP
BATT. ?
STOP
POWER OFF
CASSETTE?
REC SAFE?
REC MODE
STOP
UNLOADING
SUP FG?
TIME UP ?
UNLOAD OFF
EMERGENCY
STOP

Fig. 3-19

3.1.7 Tape counter (LC4052)

1. 4-Digit $\overline{\mathrm{UP/DOWN}}$ Counter Operation
   1) When $\overline{\mathrm{UP/DOWN}}$ is L, count-up is performed with SUP FG falling. When $\overline{\mathrm{UP/DOWN}}$ is H, count-down is performed with SUP FG rising.
   2) Counter indication is in 4 digits form 0000–9999. After 9999, 0000 is displayed again.
   3) POWER ON RST and $\overline{\mathrm{RST}}$ during counter indication cause reset to 0.
   4) While $\overline{\mathrm{RST}}$ input continues, counter reading is kept at 0.

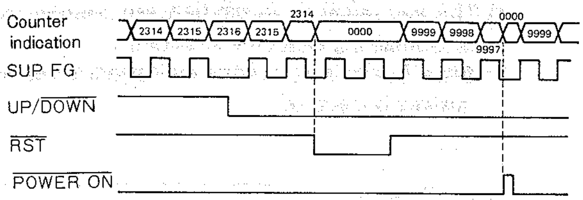

Counter indication
2314
2315
2316
2315
2314
0000
9999
9998
9997
0000
9999
SUP FG
UP/DOWN
RST
POWER ON

Fig. 3-20

2. Zero-Memory Output Operation
   1) With the Memory is set to ON, a zero-output pulse of appr. 100 msec is produced when the counter passes 0000.
   2) When $\overline{\mathrm{PLAY}}$ is L, no output is produced.
   3) Also after producing the zero-output, the Memory ON-OFF condiction does not change.

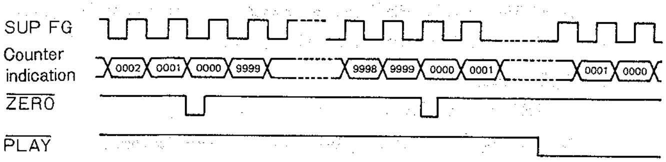

SUP FG
Counter indication
0002
0001
0000
9999
9998
9999
0000
0001
0001
0000
ZERO
PLAY

Fig. 3-21

3. Tape-Run Output Operation
   1) When $\overline{\mathrm{PLAY}}$ is L, an output pulse of appr. 400 msec is produced with SUP FG falling.
   2) When the result of remaining time calculation is less than 1 minute, 10 Hz flashing output is produced.
   3) When $\overline{\mathrm{PLAY}}$ is H, with every 2 SUP FG pulses, the $\overline{\mathrm{RUN}}$ output ON-OFF is repeated, and the last pulse only is 400 msec.

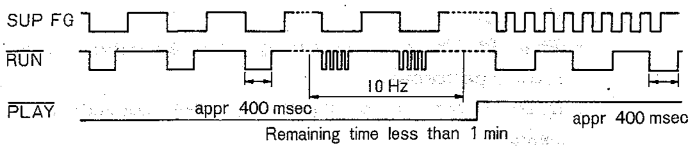

SUP FG
RUN
10 Hz
PLAY
appr 400 msec
appr 400 msec
Remaining time less than 1 min

Fig. 3-22

4. Remaining Time Indication
   1) When $\overline{\mathrm{PLAY}}$ changes from H to L, after the lapse of a fixed time interval, remaining tape time is calculated.
   2) When $\overline{\mathrm{PLAY}}$ has changed from H to L and remaining tape time indication is to be performed, a (–) bar indication is synchronized with the SUP FG, and after a fixed time interval, remaining tape time is indicated.
   3) After $\overline{\mathrm{PLAY}}$ has changed to L, the time required until remaining tape time is indicated is as follows:

      When the result of remaining tape time calculation is 500 seconds or more ..... 5 sec + (SUP FG 5–6 pulses)

      When the result of remaining tape time calsulation is less than 500 seconds ...... 5 sec + (SUP FG 8–9 pulses)
   4) When $\overline{\mathrm{PLAY}}$ changes from L to H, a compulsory change to counter indication is effected, and the remaining tape time is cleared.
   5) When during remaining tape time calcultation for fixed interval of S seconds no SUP FG input is present, the Pause mode is assumed as having been entered, and the operation for remaining tape time calculation is interrupted. When SUP FG input is detected again, the Pause mode is presumed released, and calculation operation resumed.

Tape speed	NTSC standard	NTSC×1/2	NTSC×1/3	PAL
S（秒）	2	4	6	3

   6) When the remaining tape time is 5 minutes or more, the seconds are 00, and only minutes are displayed. When the remaining tape time is less than 5 minutes, minutes and seconds are displayed.

7:00 ➡ 6:00 ➡ 5:00 ➡ 4:59 ➡ 4:58 ➡ 0:00

   7) For the second indication in remaining tape time, constant compensation is performed, and for 0.8–1.2 seconds 1 second is subtracted.
   8) When the remaining time indication is 5 minutes or more, the colon flashes in synchronization with SUP FG.
   9) When the remaining tape time indication has become 0:00, this indication is maintained.

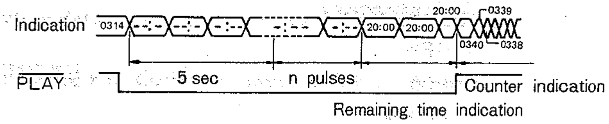

SUP FG
Indication
0314
--:-
--:-
-:--
-:--
-:--
20:00
20:00
20:00
0339
0340
0338
5 sec
n pulses
PLAY
Counter indication
Remaining time indication

Fig. 3-23

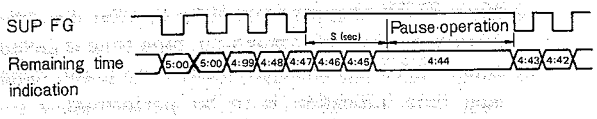

SUP FG
S (sec)
Pause operation
Remaining time indication
5:00
5:00
4:99
4:48
4:47
4:46
4:45
4:44
4:43
4:42

Fig. 3-24

- Suitable tape – TC-20

Tape length	43.7^{+2}_{0} (m)
Tape thickness	19^{+1}_{-2} (μm)
Leader tape	80±5 (mm)
Trailer tape	110±5 (mm)
Reel hub diameter	26±0.1(mm)

- Tape speed

MODE	Tape speed
NTSC Standard	33.35 (mm/sec)
NTSC 1/2 Speed	33.35×1/2 (mm/sec)
NTSC 1/3 Speed	33.35×1/3 (mm/sec)
PAL Mode	23.39 (mm/sec)

5. Key input operation

(1) RST key

1) RST resets the counter reading to zero.
2) During RST input, counter indication remains at zero.
3) When the counter is reset to zero by pressing the RST key, zero-output is not produced.
4) During remaining time indication, the RST key is inactive.

Refer to the timing chart in Fig. 3-19.

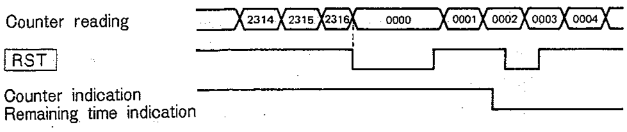

Counter reading
2314
2315
2316
0000
0001
0002
0003
0004
RST
Counter indication
Remaining time indication

Fig. 3-25

(2) MEMORY key

1) The MEMORY key switches the memory mode ON or OFF.
2) During remaining time indication, the MEMORY key is inactive.
3) During counter indication, when the memory is set to ON, the letter "M" is displayed.

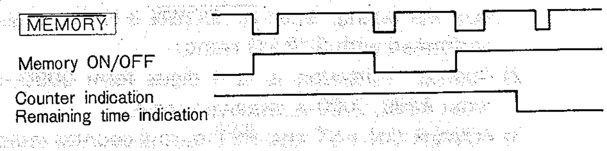

MEMORY
Memory ON/OFF
Counter indication
Remaining time indication

Fig. 3-26

(3) COUNTER/REMAINING key

1) This key serves to switch between counter indication and remaining tape time indication.
2) When PLAY is H, counter indication is displayed and this key is inactive.

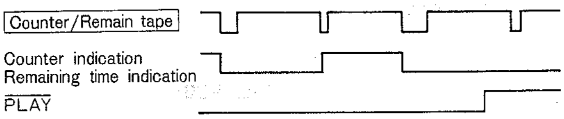

Counter/Remain tape
Counter indication
Remaining time indication
$\overline{\text{PLAY}}$

Fig. 3-27

6. Input/Output terminal operation

(1) POWER ON RST input

1) POWER ON RST rising initializes all functions: counter zero-reset, remaining time clear, memory OFF.
2) POWER ON RST pulse width is minimum 10 (μsec). Refer to the timing chart in Fig. 3-20.

(2) $\overline{\text{RST}}$ input

1) $\overline{\text{RST}}$ falling causes counter zero-reset.
2) During $\overline{\text{RST}}$ input, zero-reset is maintained.
3) Incorporates a chattering prevention circuit.
   T_{RST} is minimum 400 (msec).
   T_{DRST} is maximum 200 (msec).

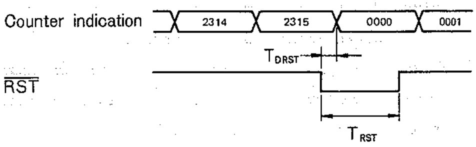

Counter indication
2314
2315
0000
0001
T_{DRST}
$\overline{\text{RST}}$
T_{RST}

Fig. 3-28

(3) $\overline{\text{PLAY}}$ input

1) When $\overline{\text{PLAY}}$ is L, remaining time calculation operation is performed.
2) When $\overline{\text{PLAY}}$ is H, remaining time calculation is cleared.

(4) $\overline{\text{STAND-BY}}$ input

1) When $\overline{\text{STAND-BY}}$ is L, the Stand-by mode is entered and the indication disappears.
2) When $\overline{\text{STAND-BY}}$ is H, during rise-up the Stand-by mode is released.
3) When $\overline{\text{STAND-BY}}$ is L, the remaining time calculation is cleared.
4) When $\overline{\text{STAND-BY}}$ is H, the counter reading is maintained.

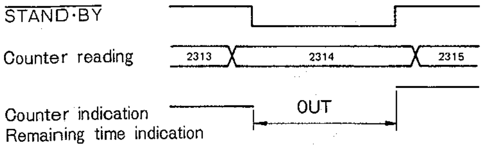

STAND·BY
Counter reading
2313
2314
2315
Counter indication
Remaining time indication
OUT

Fig. 3-29

(5) UP/$\overline{\text{DOWN}}$ input

At H, UP/$\overline{\text{DOWN}}$ performs count-up and at L count-down operation.

Refer to the timing chart in paragraph 5.3.

(6) SUP FG input

1) Input signal of 3 pulses for each turn of the supply reel.
2) With SUP FG falling, count-up is performed, and with SUP FG rising, count-down is performed, based on UP/$\overline{\text{DOWN}}$.
3) SUP FG input frequency is as follows:

	MIN	MAX
When $\overline{\text{PLAY}}$ is H.	D C	100 Hz
When $\overline{\text{PLAY}}$ is L.	D C	30 Hz

(with 50 % duty)

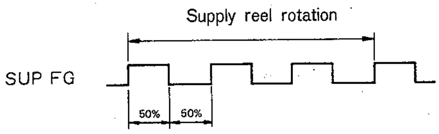

Supply reel rotation
SUP FG
50%
50%

Fig. 3-30

(7) PAL/NTSC, MODE 2, MODE 3 input

1) Selects the tape speed as shown in the chart below.

PAL/ $\overline{\text{NTSC}}$	MODE 2	MODE 3	Selected tape speed
H	X	X	PAL
L	H	X	NTSC 1/2 speed
L	L	H	NTSC 1/3 speed
L	L	L	NTSC Standard speed

X signifies either H or L.

2) If the tape speed is changed during remaining time calculation operation, the present calculation is cleared and renewed calculation starts.

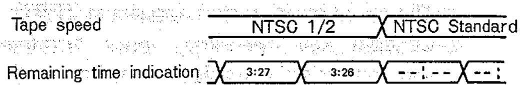

Tape speed
NTSC 1/2
NTSC Standard
Remaining time indication
3:27
3:26
--:--
--:

Fig. 3-31

(8) $\overline{\text{RUN}}$ output

Feeds out a tape-run output in synchronization with the SUP FG.

Refer to Fig. 3-22.

(9) $\overline{\text{ZERO}}$ output

When $\overline{\text{PLAY}}$ is H and the memory is ON, the counter produces a zero-memory output at 0000. Delay time T_{ZD} is max. 10 (msec), pulse width T_{ZD} is approx. 100 (msec), min. 90 (msec).

Refer to Fig. 3-21.

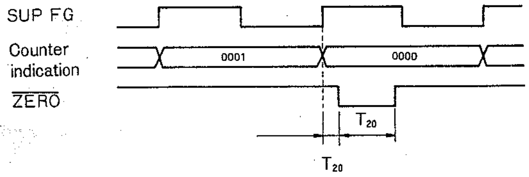

SUP FG
Counter indication
0001
0000
ZERO
T20
T20

Fig. 3-32

7. Test mode operation

1) When the LSI's port 33 is connected to port 52 and a reset input is provided, the test mode is entered.
2) The system clock output appears at $\overline{\text{RUN}}$.
3) The count clock output appears at $\overline{\text{ZERO}}$.
4) Confirm key operation, input terminal operation and indication operation according to the flowchart below.

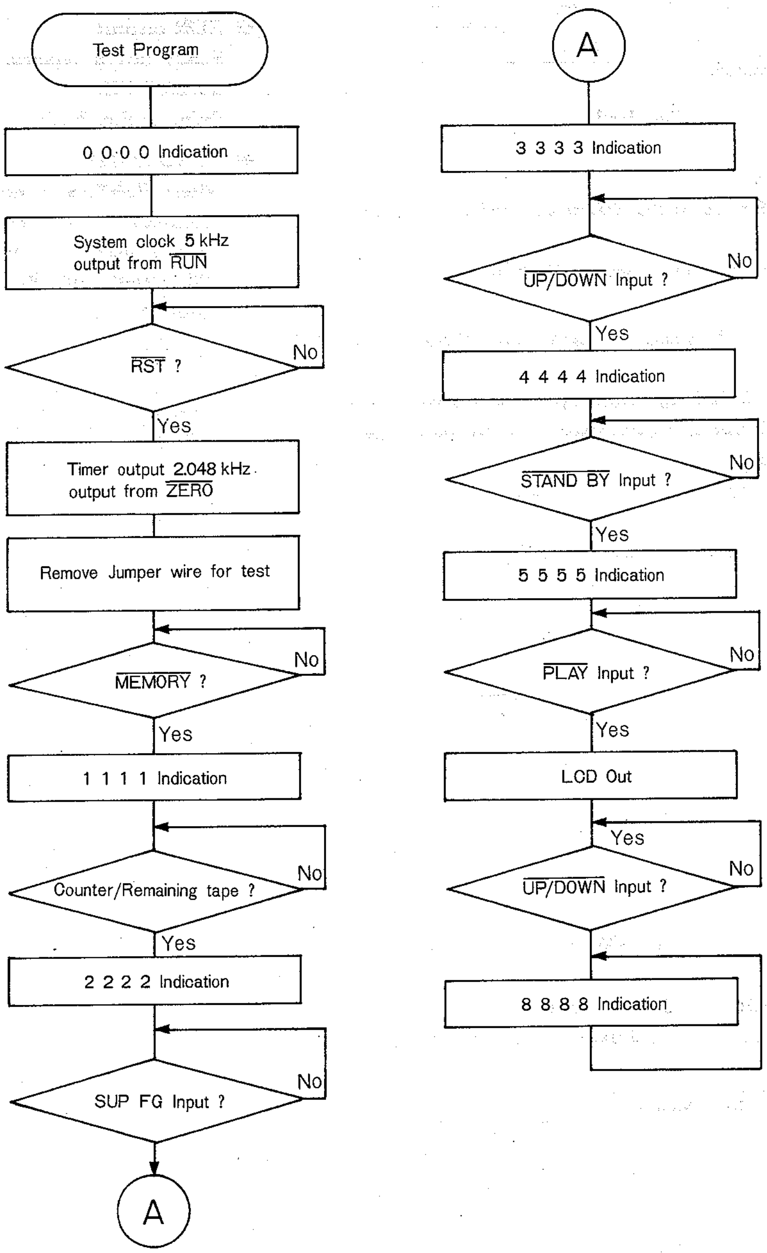

Test Program
0 0 0 0 Indication
System clock 5 kHz output from RUN
RST ?
No
Yes
Timer output 2.048 kHz output from ZERO
Remove Jumper wire for test
MEMORY ?
No
Yes
1 1 1 1 Indication
Counter/Remaining tape ?
No
Yes
2 2 2 2 Indication
SUP FG Input ?
No
A
A
3 3 3 3 Indication
UP/DOWN Input ?
No
Yes
4 4 4 4 Indication
STAND BY Input ?
No
Yes
5 5 5 5 Indication
PLAY Input ?
No
Yes
LCD Out
Yes
UP/DOWN Input ?
No
8 8 8 8 Indication

Fig. 3-33

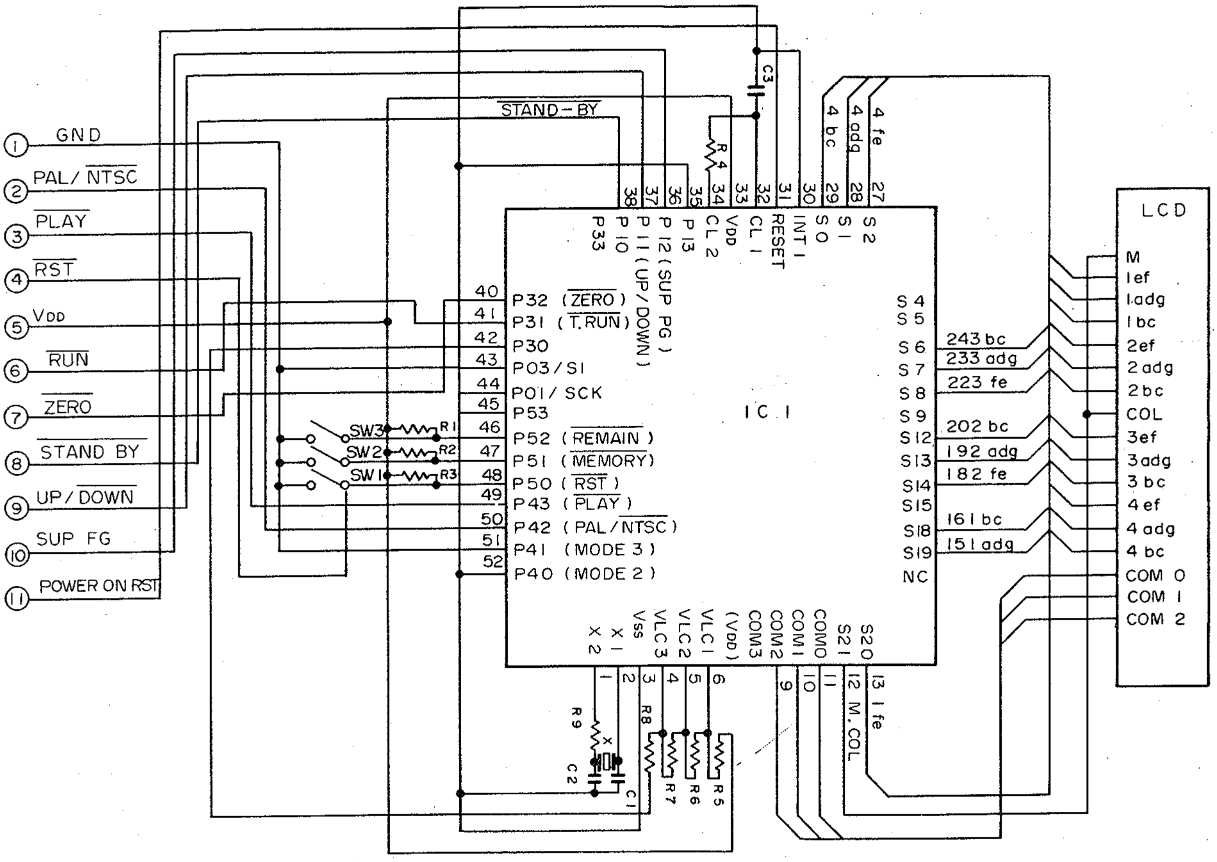

① GND
② PAL/ $\overline{\text{NTSC}}$
③ $\overline{\text{PLAY}}$
④ $\overline{\text{RST}}$
⑤ VDD
⑥ $\overline{\text{RUN}}$
⑦ $\overline{\text{ZERO}}$
⑧ $\overline{\text{STAND BY}}$
⑨ UP/ $\overline{\text{DOWN}}$
⑩ SUP FG
⑪ POWER ON RST
$\overline{\text{STAND-BY}}$
C3
R4
38 P33
37 P10
36 P11 (UP/DOWN)
35 P12 (SUP PG)
34 P13
33 CL2
32 VDD
31 CL1
30 RESET
29 INT1
28 S0
27 S1
S2
4 bc
4 adg
4 fe
40 P32 ($\overline{\text{ZERO}}$)
41 P31 ($\overline{\text{T.RUN}}$)
42 P30
43 P03/SI
44 P01/SCK
45 P53
46 P52 ($\overline{\text{REMAIN}}$)
47 P51 ($\overline{\text{MEMORY}}$)
48 P50 ($\overline{\text{RST}}$)
49 P43 ($\overline{\text{PLAY}}$)
50 P42 (PAL/$\overline{\text{NTSC}}$)
51 P41 (MODE 3)
52 P40 (MODE 2)
SW3
SW2
SW1
R1
R2
R3
IC 1
S4
S5
S6 243 bc
S7 233 adg
S8 223 fe
S9
S12 202 bc
S13 192 adg
S14 182 fe
S15
S18 161 bc
S19 151 adg
NC
LCD
M
1ef
1adg
1bc
2ef
2adg
2bc
COL
3ef
3adg
3bc
4ef
4adg
4bc
COM 0
COM 1
COM 2
1 X2
2 X1
3 Vss
4 VLC3
5 VLC2
6 VLC1
(VDD)
COM3
9 COM2
10 COM1
11 COM0
12 S21 M.COL
13 S20 1 fe
R9
R8
X
C2
C1
R7
R6
R5

Fig. 3-34 IC1 circuit

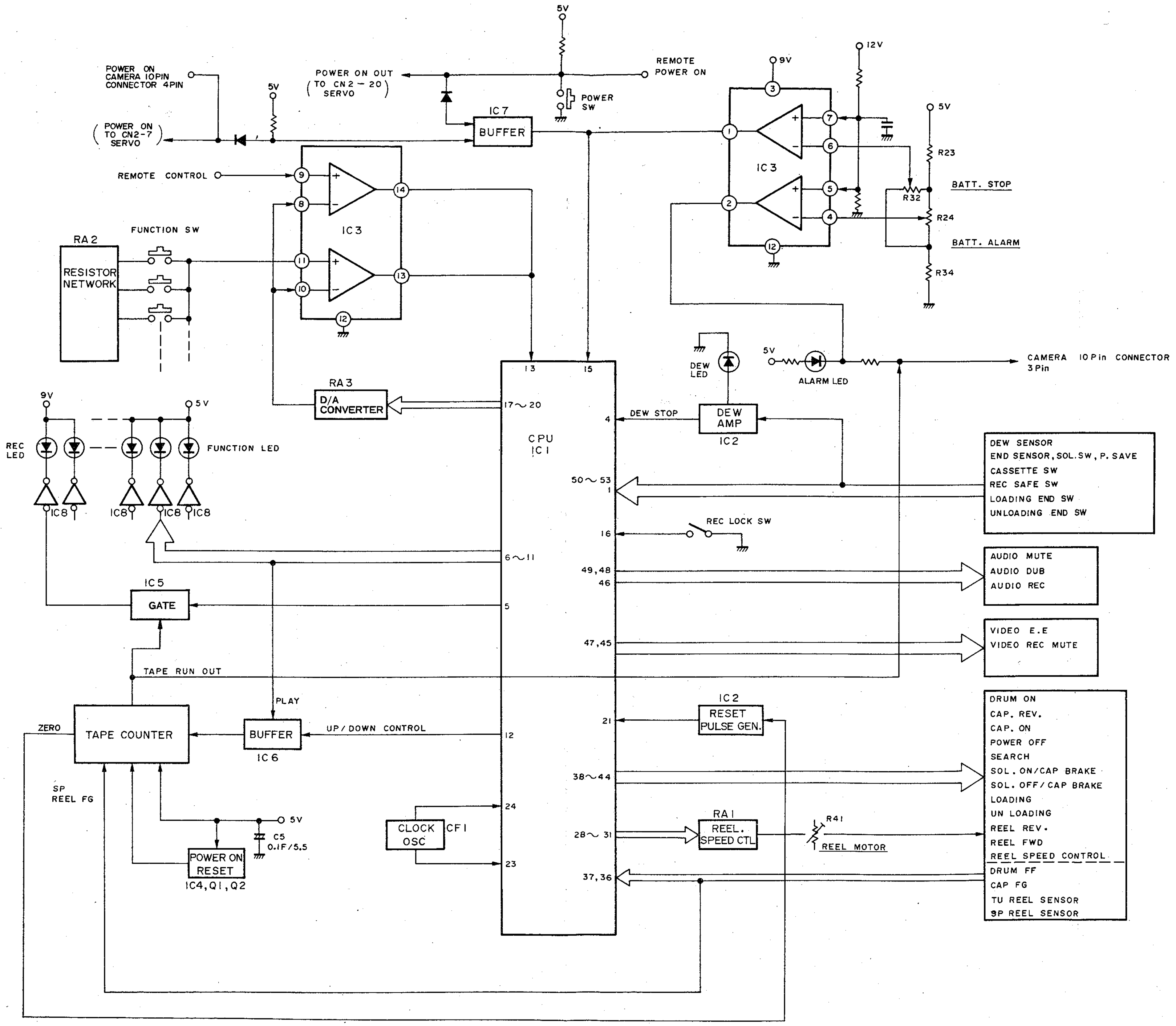

5V
POWER ON CAMERA 10PIN CONNECTOR 4PIN
POWER ON OUT (TO CN2-20 SERVO)
REMOTE POWER ON
POWER SW
IC7
BUFFER
(POWER ON TO CN2-7 SERVO)
REMOTE CONTROL
9V
12V
IC3
R23
R32
BATT. STOP
R24
BATT. ALARM
R34
FUNCTION SW
RA2
RESISTOR NETWORK
DEW LED
ALARM LED
CAMERA 10Pin CONNECTOR 3Pin
RA3
D/A CONVERTER
17~20
13
15
CPU IC1
4
DEW STOP
DEW AMP
IC2
REC LED
FUNCTION LED
IC8
DEW SENSOR
END SENSOR, SOL.SW, P. SAVE
CASSETTE SW
REC SAFE SW
LOADING END SW
UNLOADING END SW
50~53
1
16
REC LOCK SW
6~11
49,48
46
AUDIO MUTE
AUDIO DUB
AUDIO REC
IC5
GATE
5
47,45
VIDEO E.E
VIDEO REC MUTE
TAPE RUN OUT
PLAY
ZERO
TAPE COUNTER
BUFFER
IC6
UP/DOWN CONTROL
12
21
RESET PULSE GEN.
DRUM ON
CAP. REV.
CAP. ON
POWER OFF
SEARCH
SOL. ON/CAP BRAKE
SOL. OFF/CAP BRAKE
LOADING
UN LOADING
REEL REV.
REEL FWD
REEL SPEED CONTROL
DRUM FF
CAP FG
TU REEL SENSOR
SP REEL SENSOR
38~44
SP REEL FG
C5 0.1F/5.5
POWER ON RESET
IC4, Q1, Q2
CLOCK OSC
CF1
24
23
28~31
RA1
REEL. SPEED CTL
R41
REEL MOTOR
37,36

Fig. 3-35 Mechacon block diagram

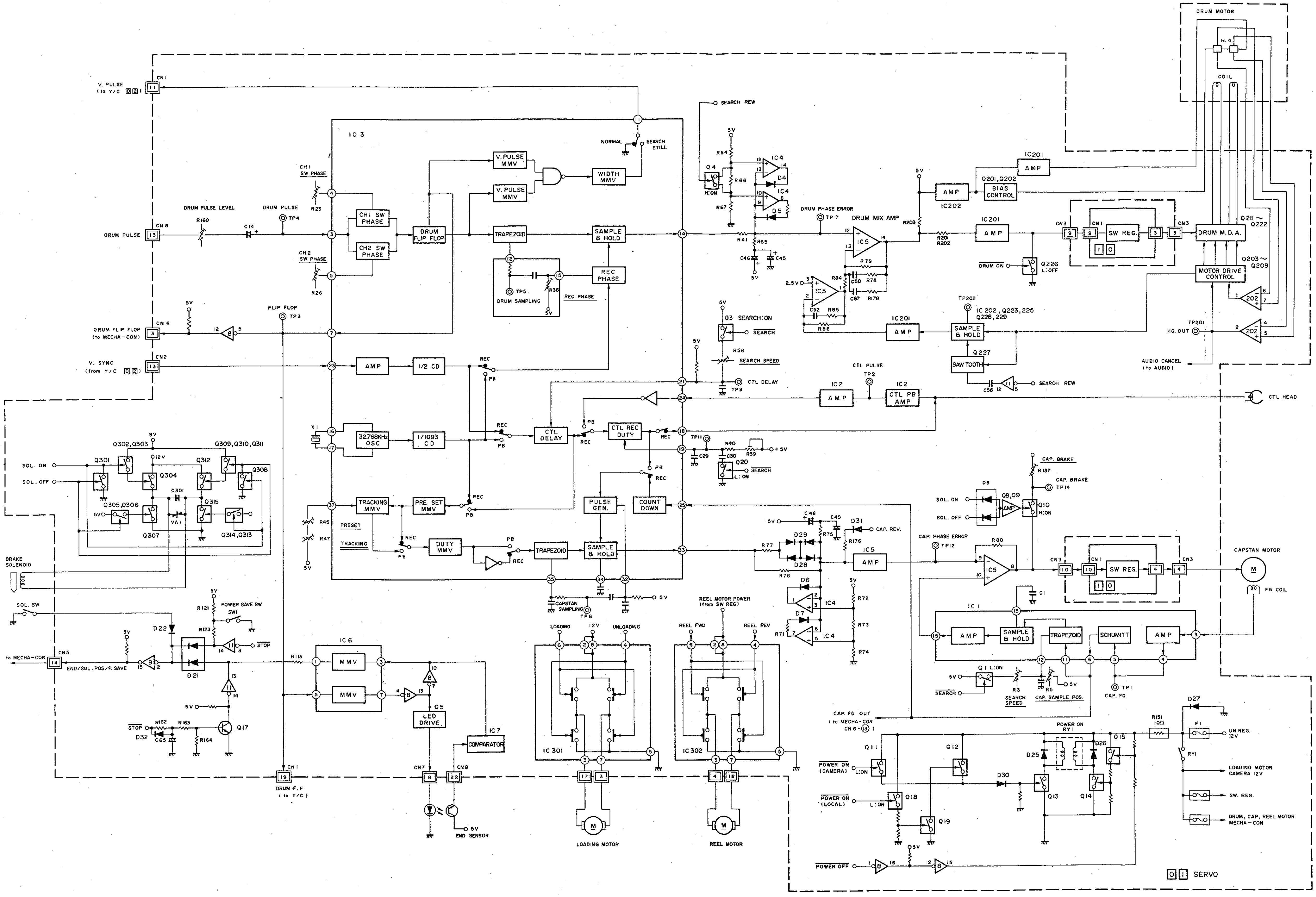

V. PULSE (to Y/C)
CN1
DRUM PULSE
CN8
DRUM FLIP FLOP (to MECHA-CON)
CN6
V. SYNC (from Y/C)
CN2
DRUM PULSE LEVEL
R160
C14
DRUM PULSE
TP4
CH1 SW PHASE
R23
CH2 SW PHASE
R26
FLIP FLOP
TP3
IC 3
CH1 SW PHASE
CH2 SW PHASE
DRUM FLIP FLOP
V. PULSE MMV
WIDTH MMV
NORMAL
SEARCH STILL
TRAPEZOID
SAMPLE & HOLD
REC PHASE
TP5
DRUM SAMPLING
R36
AMP
1/2 CD
X1
32.768KHz OSC
1/1093 CD
CTL DELAY
CTL REC DUTY
TRACKING MMV
PRE SET MMV
DUTY MMV
PULSE GEN.
COUNT DOWN
PRESET
TRACKING
R45
R47
REC
PB
CAPSTAN SAMPLING
TP6
SEARCH REW
Q4
H:ON
R64
R66
R67
IC4
D4
D5
R41
R65
C46
C45
DRUM PHASE ERROR
TP7
DRUM MIX AMP
IC5
R79
R84
C50
R78
C67
R178
C52
R85
R86
Q3 SEARCH:ON
SEARCH
R58
SEARCH SPEED
CTL DELAY
TP9
CTL PULSE
TP2
IC2
AMP
CTL PB AMP
CTL HEAD
TP11
R40
R39
C29
C30
Q20
L:ON
IC202
IC201
AMP
Q201,Q202
BIAS CONTROL
R203
R201
R202
DRUM ON
Q226
L:OFF
CN3
CN1
SW REG.
DRUM M.D.A.
Q211~Q222
MOTOR DRIVE CONTROL
Q203~Q209
DRUM MOTOR
H.G.
COIL
TP202
IC202,Q223,225 Q228,229
SAMPLE & HOLD
Q227
SAW TOOTH
C56
TP201
HG. OUT
AUDIO CANCEL (to AUDIO)
Q302,Q303
Q309,Q310,Q311
Q301
Q304
Q312
Q308
SOL. ON
SOL. OFF
Q305,Q306
Q307
VA1
Q315
Q314,Q313
C301
BRAKE SOLENOID
SOL. SW
POWER SAVE SW
SW1
R121
R123
D22
D21
STOP
to MECHA-CON
CN5
END/SOL. POS/P. SAVE
R113
IC6
MMV
LED DRIVE
Q5
IC7
COMPARATOR
R162
R163
R164
C65
D32
Q17
CN1
DRUM F.F (to Y/C)
CN7
CN8
END SENSOR
LOADING
UNLOADING
IC 301
LOADING MOTOR
REEL MOTOR POWER (from SW REG)
REEL FWD
REEL REV
IC 302
REEL MOTOR
C48
C49
D31
CAP. REV.
D29
R75
R176
R77
D28
R76
D6
D7
R71
R72
R73
R74
CAP. PHASE ERROR
TP12
CAP. BRAKE
R137
TP14
D8
Q8,Q9
Q10
H:ON
R80
C1
IC1
AMP
SAMPLE & HOLD
TRAPEZOID
SCHUMITT
Q1 L:ON
SEARCH
R3
R5
SEARCH SPEED
CAP. SAMPLE POS.
TP1
CAP. FG
CAPSTAN MOTOR
FG COIL
CAP. FG OUT (to MECHA-CON CN6-⑬)
POWER ON (CAMERA)
POWER ON (LOCAL)
POWER OFF
Q11
Q12
Q18
Q19
D30
D25
POWER ON RY1
D26
Q13
Q14
Q15
R151 10Ω
D27
F1
UN REG. 12V
RY1
LOADING MOTOR CAMERA 12V
SW. REG.
DRUM, CAP, REEL MOTOR MECHA-CON
01 SERVO

Fig. 3-36 Servo block diagram

3.2 SERVO CIRCUIT

Special Features of the HR-C3's Servo Circuit

1) New type of DD drum motor.
2) DD motor employed as capstan motor.
3) Compact design using chip components and flat ICs.
4) Energy-saving design.

3.2.1 Block diagram description

Refer to the block diagram.

The relation of reference and comparison signals in the servo circuit are shown in the chart below.

1. Drum Servo System

- For Recording

The reference signal for the drum servo circuit in recording is the vertical sync signal of the video input. The comparison signal is supplied by the drum pulse. Sync is separated from the video input signal at the Y/C board and fed to CN1 pin 13 on the servo board. The vertical input sync signal is applied to pin (23) of IC3, and transformed to 30 Hz by a 1/2 count-dwon. Then the signal is supplied to the Rec Phase MMC (monostable multivibrator) via the REC switch. The Rec Phase MMV adjusts the recording phase (switching point), and sends the reference signal to the phase comparator. The comparison signal consists of a 30-Hz trapezoidal waveform signal, produced by the drum pulse applied to IC3, pin 3 and routed through the Switch Phase MMV of CH-1 and CH-2 from the drum FF. The phase comparator produces an error voltage by comparing the reference and the comparison signal. This error voltage appears at pin 14 of IC3, and is contained within the range of appr. 2 V–3 V DC by a DC limiter circuit. The phase error voltage is then fed to IC5, pin 12 and mixed with the speed error voltage. After being amplified by IC201, it is supplied to the switch regulator. In the switch regulator circuit, this motor control voltage is amplified by appr. 2.6 times and then supplied to the drum MDA circuit to power the drum motor.

- For Playback

The 30-Hz signal generated by the X'tal oscillator serves as reference signal for the drum servo circuit in playback. Otherwise, circuit operation is the same as for recording. The V-pulse generator circuit operates during Search Rewind, Search FF, Pause (in playback), and Reverse modes. The V-pulse generator circuit is controlled by IC3, pin 31: when pin 31 is high, the V-pulse is generated.

	DRUM			CAPSTAN		
	PHASE		SPEED	PHASE		SPEED
	REFERENCE	COMPARISON		REFERENCE	COMPARISON	
REC	V. SYNC	DRUM PULSE	DRUM F/V (270 Hz)	X'TAL	CAPSTAN FG 30 Hz	CAPSTAN FG 360 Hz
PLAYBACK	X'TAL	"	"	X'TAL	CTL PULSE	"
SEARCH FF	X'TAL	"	"	X'TAL	1/3 CTL PULSE 30 Hz	CAPSTAN FG 1080 Hz
SEARCH REW	–	–	"	–	–	"
EDIT	X'TAL (V. sync Reset) ⟶ V. SYNC	DRUM PULSE	"	X'TAL (V. sync Reset) ⟶ X'TAL	CTL PULSE (FG Reset) ⟶ CAP. FG	CAPSTAN FG 360 Hz

Table 3-1

		Speed Servo			Phase Servo			MDA	Motor
		IC201 Pin 12	IC201 Pin 14	IC5 Pin 1	IC5 Pin 12	IC5 Pin 14	IC201 Pin 8		
Phase Error	Delayed	–	–	–	Increase	Increase	Increase	Increase	Increase
	Normal	2.5 V	2.5 V	2.5 V	2.5 V	2.6 V	1.7 V	3.8 V	30 Hz
	Advanced	–	–	–	Decrease	Decrease	Increase	Decrease	Decrease
Speed Error	Slow	Increase	Increase	Decrease	–	Increase	Increase	Increase	Increase
	Normal	2.5 V	2.5 V	2.5 V	2.5 V	2.6 V	1.7 V	3.8 V	30 Hz
	Fast	Decrease	Decrease	Increase	–	Decrease	Decrease	Decrease	Decrease

Table 3-2

- Speed Control

  As opposed to previous models, the HR-C3 employs a new type of drum DD motor without FG system. F/V conversion is performed using the drum MDA switching pulses from the Hall element. For circuit operation, refer to the circuit diagram.

2. Capstan Servo system

- For Recording

  X1 generates a 32.768-kHz signal, which is divided by the factor 1093 to arrive at a 30-Hz signal which serves as capstan reference signal for recording. The comparison signal is arrived at by frequency division from the capstan FG signal. The 360-Hz capstan FG signal is amplified by IC1 and fed to IC3, pin 25. Inside IC3, the FG signal is subjected to count-down and sent as a 30-Hz sampling pulse to the phase comparator. There, it is compared with the trapezoidal waveform signal from the X'tal, and the error voltage appears at IC3, pin 33. This error voltage passes though the linear circuit made up of D28 and D29, and is contained within the range of 1.9 V–3.1 V by a DC limiter circuit. After passing the VF circuit of IC5, pins 5, 6 and 7, the voltage is mixed with the speed error voltage and sent to the switch regulator circuit. There, the input error voltage is amplified by appr. the factor 2.6 and the voltage is applied to the MDA inside the capstan motor as control voltage.

- For Playback

  The capstan comparison signal for playback is derived from the CTL pulses stored on the tape during recording. Therefore, during playback the phase comparator compares the CTL pulse and the trapezoidal waveform signal from the X'tal. Also, during playback the tracking MMV performs phase adjustment of the CYL pulse for interchangeability.

3. Power Line Configuration

The HR-C3 possesses basically 7 power supply lines. For servicing, it is useful to keep the line configuration in mind. Please refer to the power supply line chart.

The 12 V DC power supplied from the battery or the AC adapter is fed to the power-on/off relay via F1. Regarding operation of the power-on/off circuit, refer to the mechacon circuit description.

Having passed the relay, the 12 V DC power supply is divided into 3 routes.

1) Direct line : loading motor, brake solenoid, camera 12 V
2) via F2, 1A : 5 V line, 9 V line
3) via F3, 1A : motor power supply

Therefore, if a fuse has blown, the cause can be traced separately for the 3 power supply lines.

1) 12 V line (direct) : loading motor, solenoid, camera 12 V
2) 5 V line : servo circuits, video circuit (color IC7 power supply), mechacon circuits
3) 9 V line : drum MDA circuit, loading motor reference power supply, video circuits, end sensor LED drive circuit, audio circuit, solenoid circuit, mechacon circuit
4) Reel motor power : reel motor power supply
5) Capstan motor power : capstan motor power supply
6) Drum motor power : drum motor power supply
7) 12 V line (via F3) : mechacon circuit (low battery voltage sensing circuit)

The above described lines make up the power supply circuit.

		Speed Servo		Phase Servo	Mix	Motor	
		TP-1	IC1 Pin 15	IC5 Pin 9	IC5 Pin 8	MDA	Motor
Phase Error	Delayed	–	–	Decrease	Increase	Increase	Increase
	Normal	360 Hz	2.3 V	2.3 V	0.6 V	1.6 V	Constant
	Advanced	–	–	Increase	Decrease	Decrease	Decrease
Speed Error	Slow	Decrease	Increase	–	Increase	Increase	Increase
	Normal	360 Hz	2.3 V	2.3 V	0.6 V	1.6 V	Constant
	Fast	Increase	Decrease	–	Decrease	Decrease	Decrease

Table 3-3

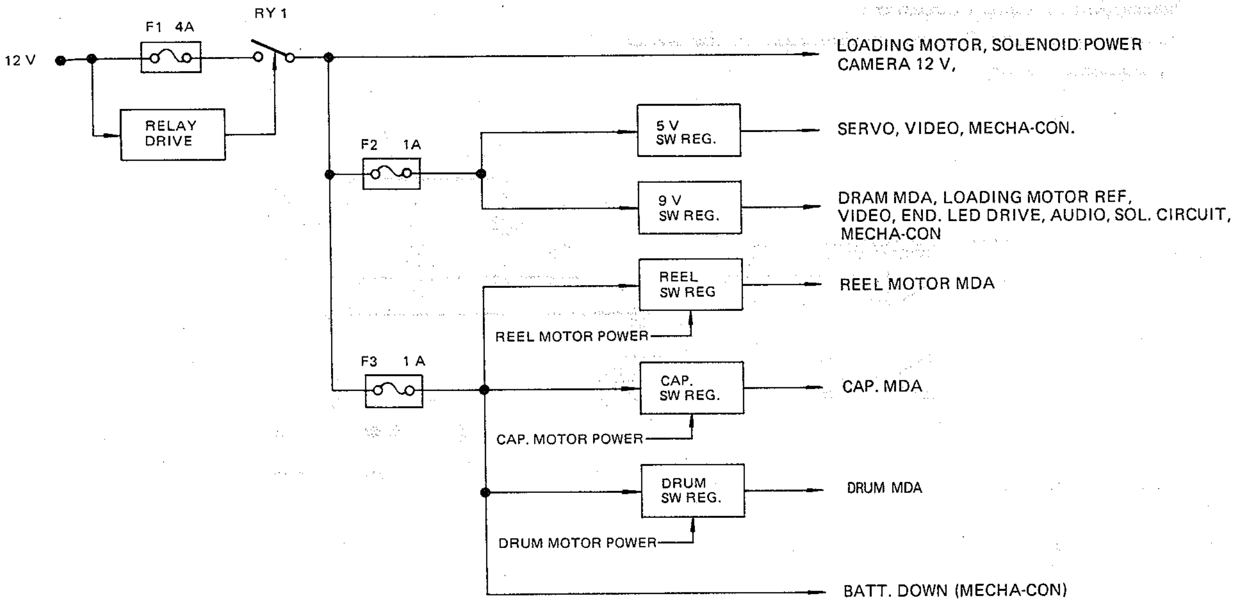

12 V
F1 4A
RY 1
RELAY DRIVE
F2 1A
F3 1 A
5 V SW REG.
9 V SW REG.
REEL SW REG
CAP. SW REG.
DRUM SW REG.
REEL MOTOR POWER
CAP. MOTOR POWER
DRUM MOTOR POWER
LOADING MOTOR, SOLENOID POWER
CAMERA 12 V,
SERVO, VIDEO, MECHA-CON.
DRAM MDA, LOADING MOTOR REF,
VIDEO, END. LED DRIVE, AUDIO, SOL. CIRCUIT,
MECHA-CON
REEL MOTOR MDA
CAP. MDA
DRUM MDA
BATT. DOWN (MECHA-CON)

Fig. 3-37 Power supply system

3.2.2 Switching regulator circuit

1. Outline

The HR-C3 employs a switching regulator circuit for the power supply in order to achieve low power consumption.
Recently, switching regulator circuits are widely used as power supplies in microcomputer applications, etc. In the following explanation, at first a comparison to ordinary regulator circuits is given.

In a conventional regulator circuit with 12 V input and a 9 V regulated output, a voltage drop of 3 V is sustained at the transistor in the regulator circuit. In the case of a 100 mA current, the resulting power consumption is 3 V x 100 mA = 300 mW.

In a switching regulator circuit as employed in the HR-C3, however, the transistor in the regulator circuit completely switches ON and OFF, controlled by a switching pulse of several tens of kHz generated by an oscillator. Therefore, the power consumption at the transistor during the OFF interval is zero (completely switched off) and in the ON interval (completely switched on), the voltage drop at the transistor is only approx. 0.1 V. (Refer to the chart.)
As a result, the power consumption for a current of 100 mA during the ON interval of the transistor is 100 mA x 0.1 V = 10 mW. In comparison to a conventional regulator circuit, the switching regulator circuit's power consumption of 10 mA means a reduction to approx. 1/30.
Refer to the basic block diagram.

The input of 12 V is supplied to the low-pass filter by TR1 as a continuous pulse. The low-pass filter smoothes the continuous pulse to an output of 9 V. This 9 V output is adjusted by the 9 V ADJ. VR and supplied to the DC comparator 1. The comparator 1 compares it with the fixed voltage from the regulator and feeds it out to comparator 2. Comparator 2 compares the DC voltage output from comparator 1 with a triangular waveform signal generated by an oscillator and produces a pulse to be fed to the E. switch. Because the pulse width is altered by alterations in the 9 V DC, ON/OFF of TR1 is controlled to achieve stable output at all times.

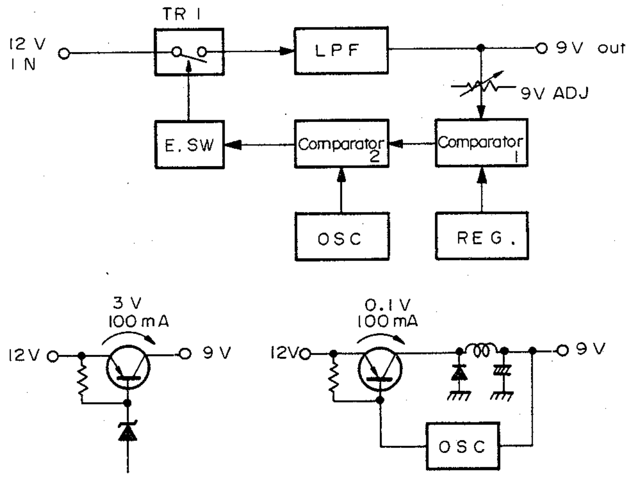
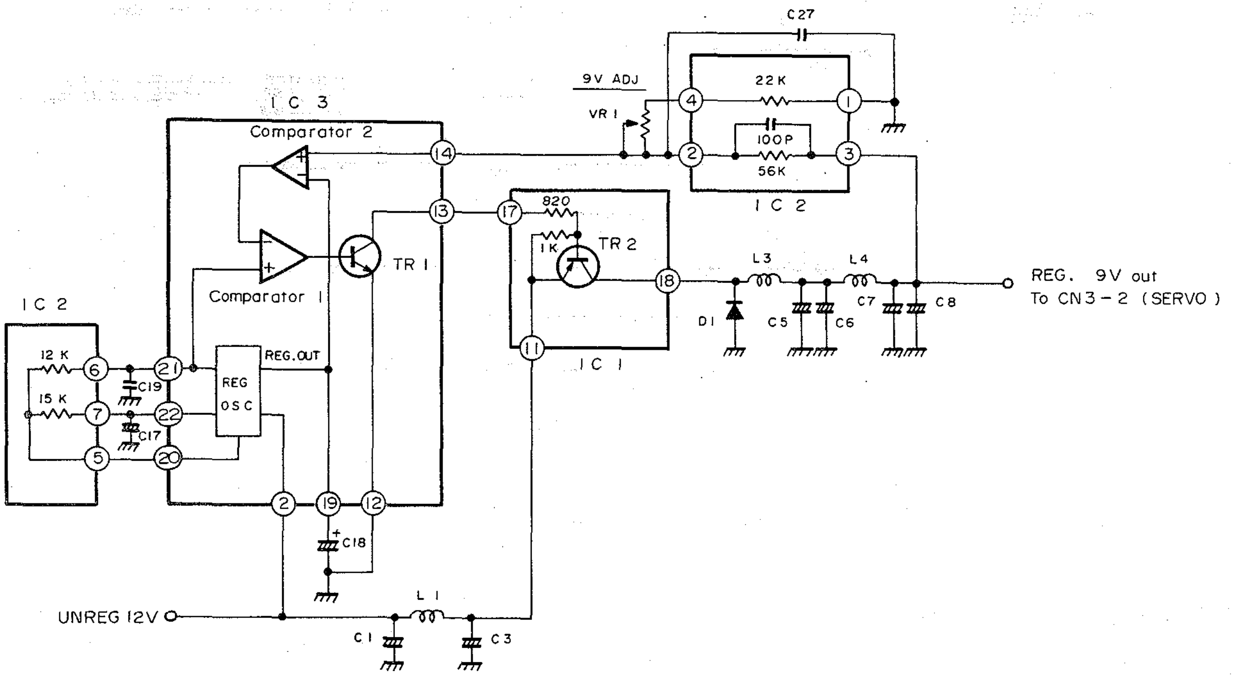

TR 1
12 V IN
LPF
9V out
9V ADJ
E. SW
Comparator 2
Comparator 1
OSC
REG.
3 V
100 mA
12V
9 V
0.1 V
100 mA
12V
9 V
OSC

Fig. 3-38 Switching regulator principle

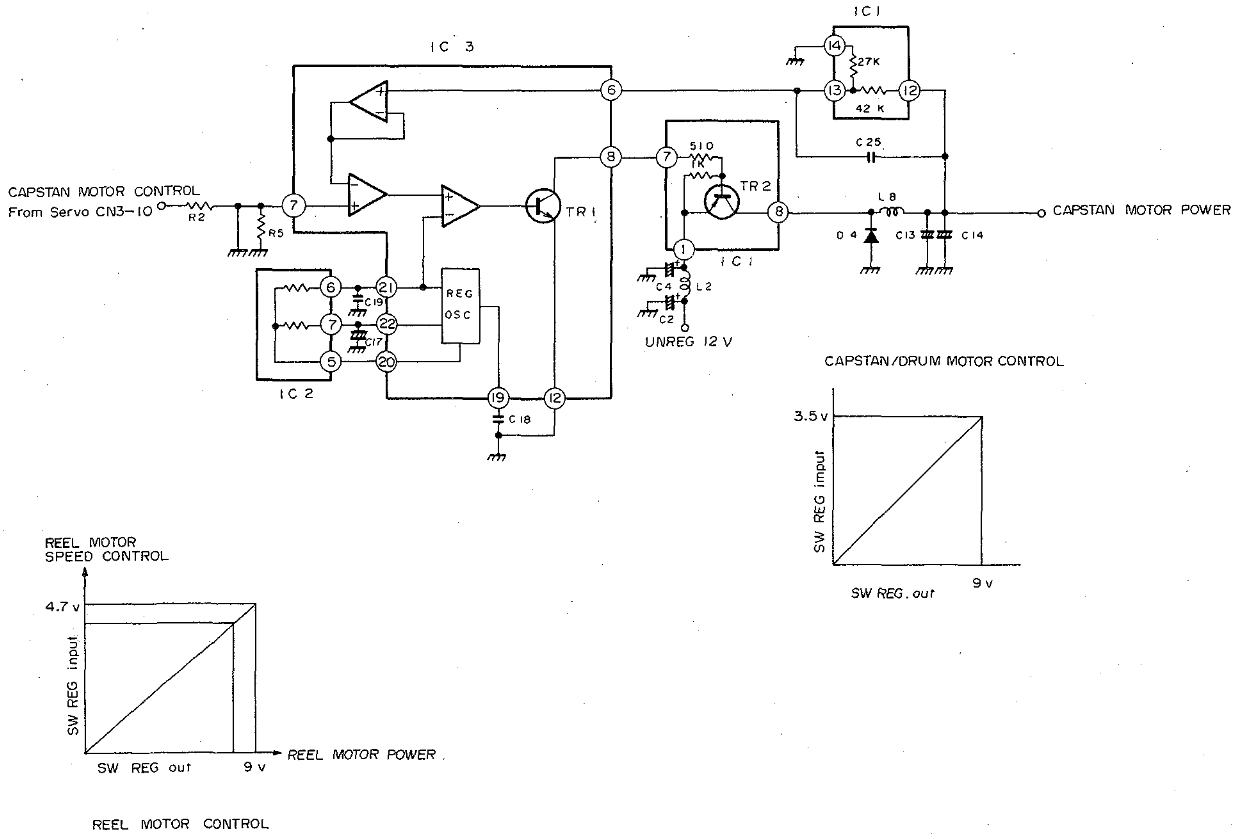
2. Description of Circuit operation

The chart shows the 9 V line configuration of the switching regulator circuit.



C27
9V ADJ
VR1
22K
100P
56K
IC 2
IC 3
Comparator 2
Comparator 1
TR 1
820
1K
TR 2
IC 1
L3
L4
D1
C5
C6
C7
C8
REG. 9V out
To CN3-2 (SERVO)
IC 2
12 K
15 K
C19
C17
REG.OUT
REG
OSC
C18
L1
C1
C3
UNREG 12V

Fig. 3-39 9 V power supply system



IC 1
27K
42 K
C25
IC 3
CAPSTAN MOTOR CONTROL
From Servo CN3-10
R2
R5
TR 1
510
1K
TR 2
L8
D4
C13
C14
CAPSTAN MOTOR POWER
C4
L2
C2
UNREG 12 V
IC 2
C19
C17
REG
OSC
C18
CAPSTAN/DRUM MOTOR CONTROL
3.5 v
SW REG input
SW REG. out
9 v
REEL MOTOR SPEED CONTROL
4.7 v
SW REG input
SW REG out
9 v
REEL MOTOR POWER
REEL MOTOR CONTROL

Fig. 3-40 Cap. motor power supply system

The oscillator in IC3 is made up of a CR combination by R (inside IC2) connected to pin 21 and C19. This circuit oscillates with a frequency of approx. 39 kHz. The generated signal with triangular waveform is applied to the (+) input side of DC comparator 1 inside IC3.

This triangular signal causes an output pulse to be fed to the base of TR1 from the voltage charged at the (–) side. TR1 switches ON while the positive pulse is applied to its base and sends a reactive pulse to TR2 inside IC1. Because an unregulated 12 V voltage lies at the emitter of TR2, the 12 V voltage appears at its collector while TR2 is ON. This output pulse of 12 V (approx. 40 kHz) is smoothed to 9 V by the low-pass filter made up of L3, L4, C5, C6, C7, C8. This 9 V output voltage is fed back to IC2 pin 3, adjusted by VR1 9 V ADJ. and applied to IC3 pin 14. At the comparator 2 inside IC3, the feedback voltage potential is amplified and again fed back to the (–) input side of the comparator. Depending on the potential variations of this (–) input, the threshold potential of the comparator varies, determining the output pulse width. Thereby 9 V line variations caused by varying load conditions are compensated for.

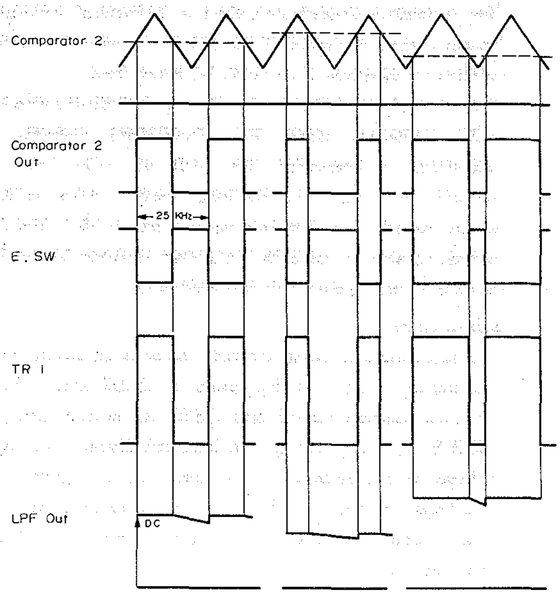
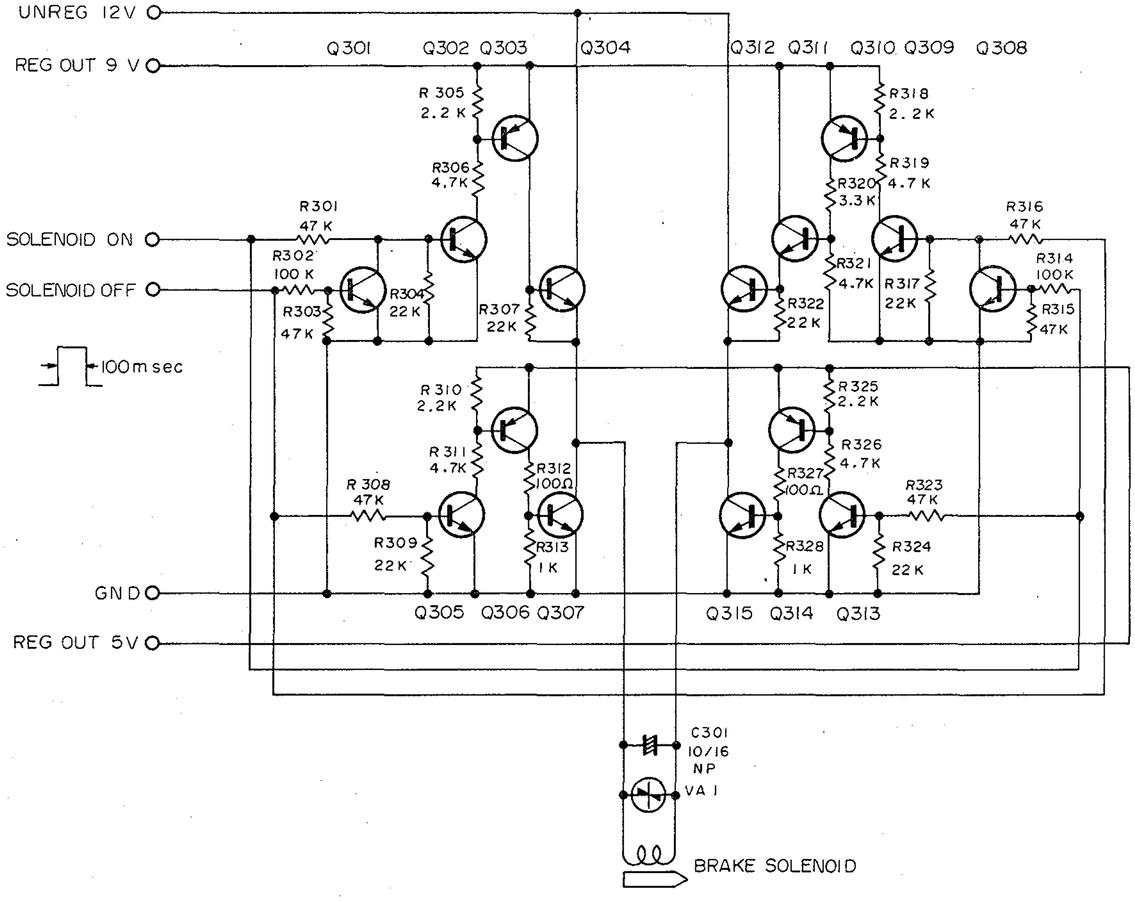


Fig. 3-41 Switching regulator timing

3.2.3 Servo related circuits

1. Brake Solenoid circuit



UNREG 12V
REG OUT 9 V
SOLENOID ON
SOLENOID OFF
100m sec
GND
REG OUT 5V
Q301
Q302 Q303
Q304
Q312 Q311
Q310 Q309
Q308
R 305
2.2 K
R306
4.7K
R301
47 K
R302
100 K
R303
47 K
R304
22 K
R307
22K
R318
2.2K
R319
4.7 K
R320
3.3 K
R321
4.7K
R322
22 K
R317
22K
R316
47 K
R314
100K
R315
47K
R310
2.2K
R311
4.7K
R312
100Ω
R308
47K
R309
22K
R313
1 K
Q305 Q306 Q307
R325
2.2K
R326
4.7K
R327
100Ω
R323
47K
R328
1 K
R324
22 K
Q315 Q314 Q313
C301
10/16
NP
VA 1
BRAKE SOLENOID

Fig. 3-42 Solenoid drive circuit

The solenoid circuit employs a transistor configuration because during solenoid operation a maximum electrical current of approx. 2 A must be sustained.

The circuit is driven by the solenoid-on/solenoid-off pulse supplied from the mechacon circuit. Circuit operation is basically the same as with other switch circuits. As with the loading motor drive circuit, the power supply for the solenoid drive is 12 V and the 9 V power supply is used as reference voltage to control the current flowing through the solenoid.

2. Solenoid on
The solenoid-on pulse of 100 msec is supplied from the mechacon circuit to the bases of Q302 and Q313. This On-pulse causes Q302 and Q303 to switch ON, and via Q303 9 V is applied to the base of Q304. This reference voltage of 9 V applied to the base causes Q304 to supply a voltage of approx. 8 V to the solenoid. At the same time, Q313, 314 and 315 become ON, and the solenoid switches on.

3. Solenoid off
The solenoid-off pulse is applied to the base of Q305 and Q309. For release of the solenoid, it is only necessary to create a magnetical field to overcome the holding magnet power, and it suffices to drive the solenoid with approx. 4–5 V. When Q310 becomes ON, the 9 V are divided by R320 and R321, and a voltage of approx. 5 V is applied to the base of Q311. This causes Q311 and Q312 to operate and supply a potential of approx. 5 V to the solenoid coil.
At the same time, Q305, 306 and 307 become ON, and the solenoid switches off.

4. Loading Motor Drive circuit
The loading motor is powered from the 12 V power supply. The servo circuit IC301 forms a switch circuit for the loading motor. The 12 V power supply is connected to pins 2 and 8 of IC301. The loading or unloading conditions are applied to pins 4 and 6 of IC301 from the mechacon circuit. These control the forward or reverse rotation of the loading motor. To pins 1 and 9 of IC301 the reference voltage is applied for fixed rotation (8 V) of the loading motor. If used directly, variations in the 12 V power supply would cause irregular motor rotation. To prevent this, the 9 V reference voltage is used to achieve stable rotation.

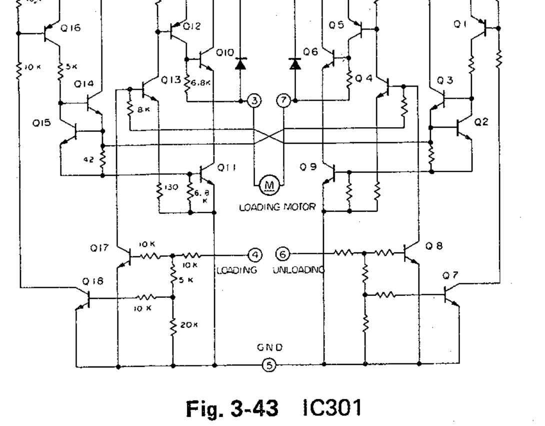

UNREG 12V
9V
①
②
⑧
⑨
Q16
Q12
Q10
Q6
Q5
Q1
Q14
Q13
Q4
Q3
Q15
Q2
③
⑦
Q11
Q9
LOADING MOTOR
Q17
Q18
Q8
Q7
④
⑥
LOADING
UNLOADING
GND
⑤
10K
5K
6.8K
8K
42
130
20K

Fig. 3-43 IC301

The IC301 reduces the power supply to 8 V for stable rotation of the loading motor. Therefore, IC301 has a maximum power consumption of 4 V x 400 mA = 1.6 W during loading motor operation. However, this does not consist a problem, because the motor operation time during loading or unloading is only approx. 3 seconds. The reel motor circuit employs the same configuration, but as the reel motor is rotating constantly, an IC with low power consumption is used.

5. Reel Motor Drive circuit
The principle of this circuit is the same as for the loading motor circuit, but in comparison to IC301, IC302 is designed for low power consumption. This design is necessary because the operating time of the reel motor is much longer than that of the loading motor.

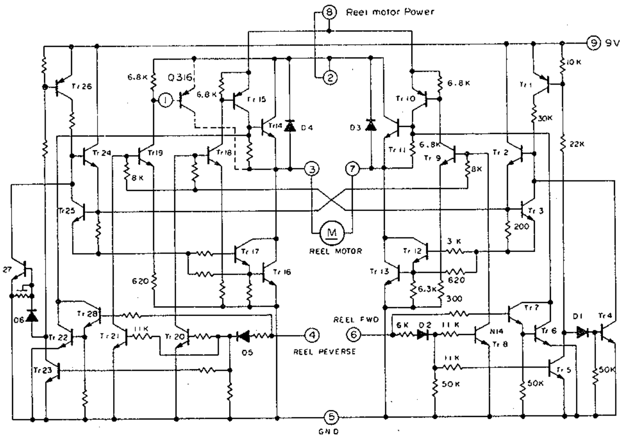

⑧ Reel motor Power
⑨ 9V
Q316
①
②
③
⑦
Tr1
Tr2
Tr3
Tr4
Tr5
Tr6
Tr7
Tr8
Tr9
Tr10
Tr11
Tr12
Tr13
Tr14
Tr15
Tr16
Tr17
Tr18
Tr19
Tr20
Tr21
Tr22
Tr23
Tr24
Tr25
Tr26
Tr27
Tr28
D1
D2
D3
D4
D5
D6
REEL MOTOR
REEL FWD
REEL REVERSE
④
⑥
GND
⑤
6.8K
10K
30K
22K
8K
200
3K
620
6.3K
300
11K
6K
50K

Fig. 3-44 IC302

6. End Sensor circuit
The HR-C3 does not possess a cassette lamp due to space considerations. Therefore, end-of-tape sensing in the Fast-Forward and Rewind modes is performed by detecting the stop of reel rotation and setting the unit to the Stop mode. As the tape is pulled by the pinch-roller during Play, end-of-tape sesing in this case is performed by an end sensor. This end sensor operates only in the Play, Record and Search FF modes.
The end sensor circuit and operation timing is shown in the chart.
In ordinary optical sensing circuits, a LED is constantly driven and a photo sensor detects the light from the LED. This requires a current of approx. 100 mA for the LED. In the case of the HR-C3, driving the LED con-

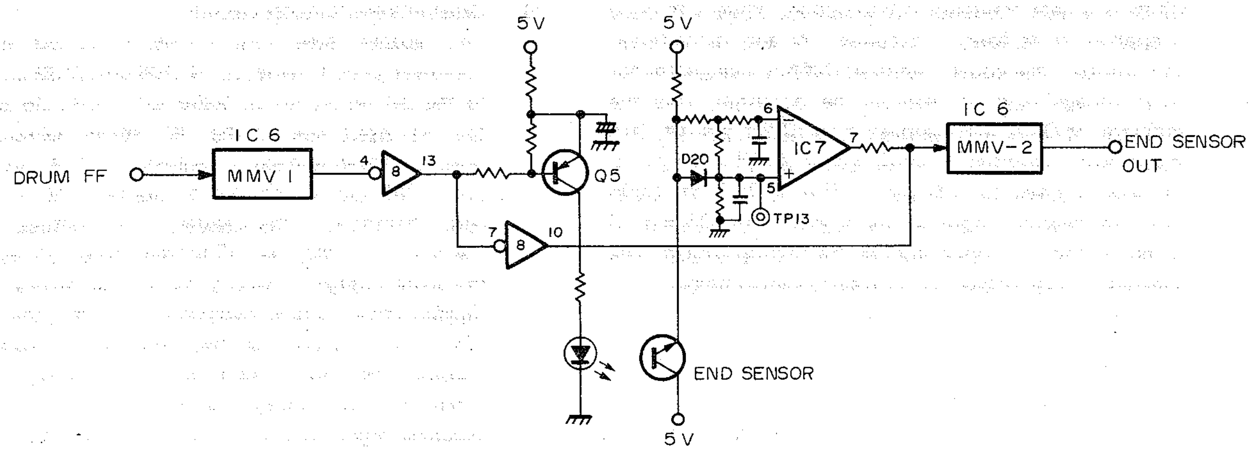


Fig. 3-45 End sensor drive circuit

stantly would mean a power consumption of 5 V x 100 mA = 500 mA. To avoid this power loss, the HR-C3 employs a pulse drive system for the end sensor drive circuit.

As a reference signal to drive the end sensor LED, the drum FF signal is used. Because the drum FF signal is 30 Hz, it would cause the LED to light for 16.7 msec if used directly, which would not yield sufficient power conservation. Therefore, the MMV-1 of IC6 is employed to change the LED drive pulse to shorter 200 μsec intervals. The output is reversed at IC8 and drives Q5 to control the LED. Because the LED drive interval is only 200 μsec, the 9 V power supply is used for lighting the LED.

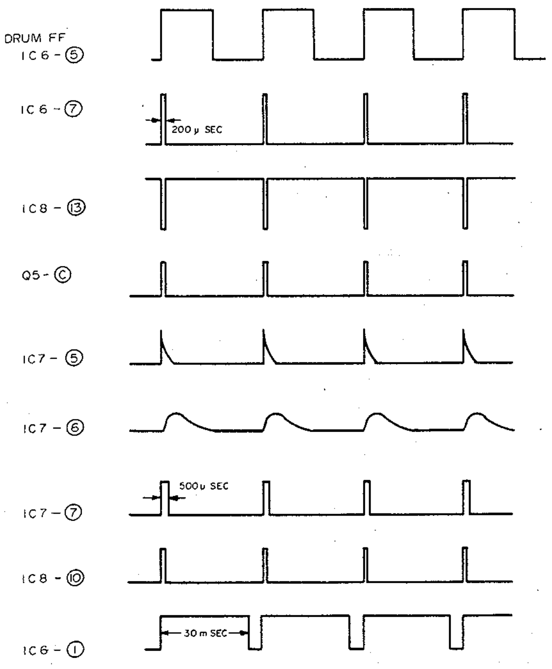


Fig. 3-46 End sensor drive timing

The end sensor receives this pulse and supplies it to IC7 pin 5 and 6. Because the time constant of IC7 pin 5 is set to a shorter value than IC7 pin 6, the electric potential of IC7 pin 5 is raised when the end sensor detects light from the LED, and a pulse of approx. 500 μsec is sent out from IC7 pin 7. This output pulse, by the AND gate with IC8 pin 10, is supplied to the MMV-2 in IC6. In order to prevent IC7 pin 7 from producing an error pulse due to noise etc., IC8 pin 10 cancels the output from IC7 pin 7 when the LED is not on. The MMV-2 of IC6 converts the end sensor pulse into sufficient length to be processed by the mechacon's CPU.

7. Drum F/V Converter circuit (Speed control circuit)

   The signal from HG1 and HG2 in the drum motor is supplied to the HG amplifier IC202. At IC202, it is amplified to a switching pulse and then applied to the bases of Q204 and Q203. After being inverted at Q204 and Q203, the switching output is sent as a switching pulse to the drum motor drive circuit via Q208, 205, 209 and 207.

   The switching pulse from the collector of Q203 is differentiated C207, R260 and supplied to IC202 pin 8. When a negative pulse is applied to pin 8 of IC202, a positive pulse is sent out from pin 14. This pulse resets Q227 and charging starts with the time constant set by R259, R252 and C205. When the charging voltage exceeds 2.1 V DC, D203 becomes ON and the trapezoidal signal is DC-clipped at 2.1 V.

- Operation of Q228 and Q229

  During ordinary drum rotation, pin 12 of IC201 is charged with a potential of approx. 2 V, and therefore Q228 and Q229 are cut off and do not operate. Only when IC201 pin 8 is at low potential, that is during start-up, do Q228 and Q229 become ON and the potential of the collector of Q228 is applied to IC201 pin 12, thereby improving the drum start-up characteristics.

Q225 is a gate transistor for sampling. While a H pulse is applied to its base, it becomes ON and its collector and emitter have equal potential. C206 is a capacitor for error voltage hold. It receives the potential from the collector of Q225 and supplies it to IC201 pin 12. This speed error potential is amplified at IC201 pin 12, 13, 14 and supplied to IC5 pin 2. Pins 1, 2, 3 of IC205 form an inverter amplifier. Its output from IC5 pin 13 is fed to the (—) input side of the mixing circuit. The relation of each output vs. rotation is shown below.

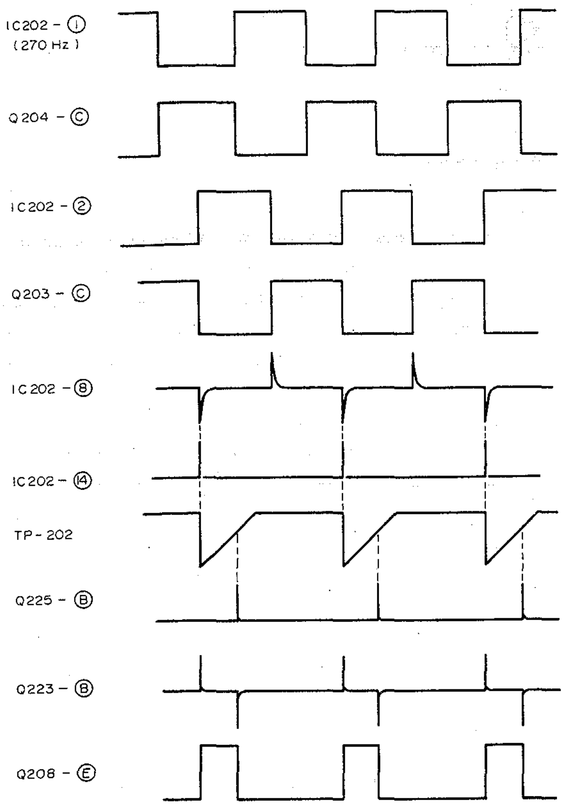


Fig. 3-47 Drum F/V timing

8. Capstan Error Limiter circuit

The capstan phase error voltage is routed through the nonlinear circuit made up of D28 and D29 and supplied to the DC limiter circuit made up of IC4, D6 and D7. To the (+) input side of the DC limiter circuit, a fixed resistor-divided voltage is applied. To IC4 pin 3 approx. 3.1 V DC and to IC4 pin 5 approx. 1.9 V DC are aplied. Therefore, if the capstan error voltage is between 1.9 V–3.1 V DC, the DC limiter circuit is inactive and the error voltage is directly fed to the motor. When the capstan error voltage exceeds 3.1 V DC, the output of IC4, pin 1 reverts to low potential, causing D6 to become ON and contain the error voltage at 3.1 V. When the error voltage falls below 1.9 V DC, IC4 pin 7 becomes High, causing a current to flow through D7 and containing the capstan error voltage at 1.9 V. In this way, the capstan error voltage is controlled to remain in the range of 3.1 V DC—1.9 V DC, with a center potential of approx. 2.5 V DC.

- Operation of D31, R176

The HR-C3 does not apply phase control during Rewind. In order to attempt a reduction of picture noise movement during Search Rewind, a High voltage potential is supplied from D31 and added to the capstan error voltage via R176. The DC limiter circuit then fixes the error voltage at 3.1 V DC. By fixing the capstan error voltage at 3.1 V DC during Search Rewind, a certain reduction in noise bar rolling speed is achieved.

D31 also fixes the capstan error voltage at 3.1 V DC for improved start-up from the Pause mode.

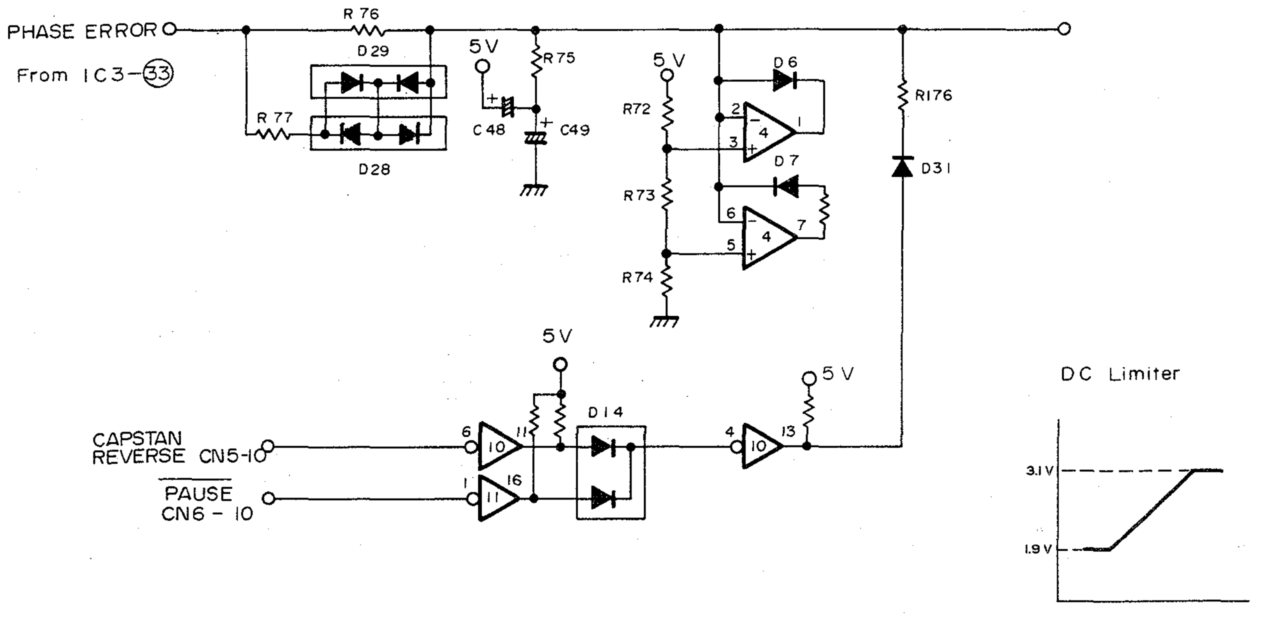


Fig. 3-48 Capstan DC limiter circuit

9. Drum DC Limiter circuit

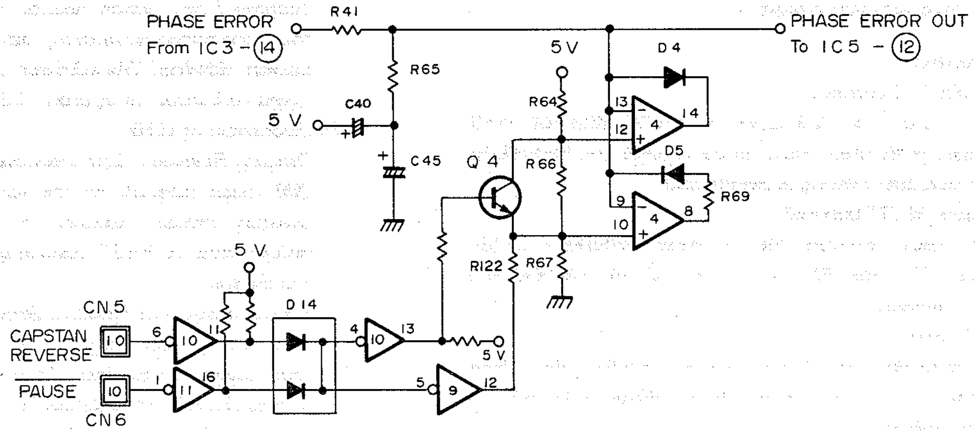

PHASE ERROR
From IC3-⑭
R41
R65
C40
5 V
C45
Q 4
5 V
D 4
R64
13
12
4
14
D5
R66
9
10
8
R69
R122
R67
PHASE ERROR OUT
To IC5 - ⑫
5 V
CN5
CAPSTAN
REVERSE
10
PAUSE
10
CN6
6
10
11
1
11
16
D 14
4
10
13
5 V
5
9
12

Fig. 3-49 Drum DC limiter circuit

Circuit operation is the same as for the capstan error DC limiter circuit.

- Operation of Q4, R121

During Search Rewind, Q4 becomes ON, to fix the DC limiter voltage and thereby the drum error voltage. R121 is added to prevent a rise in electric potential at R67 when Q4 becomes ON and a current flows through its base.

10. Mode Change Ligic circuit

Due to space considerations of the mechacon circuit, the logic circuitry for mode change is included in the servo circuit. Explanation of logic for audio and video circuits and for servo circuits is given separately.

- Audio, Video control

As shown in the chart, 4 kinds of signals (Video Rec Mute, Audio Rec, Audio Dub, Video EE) for control of

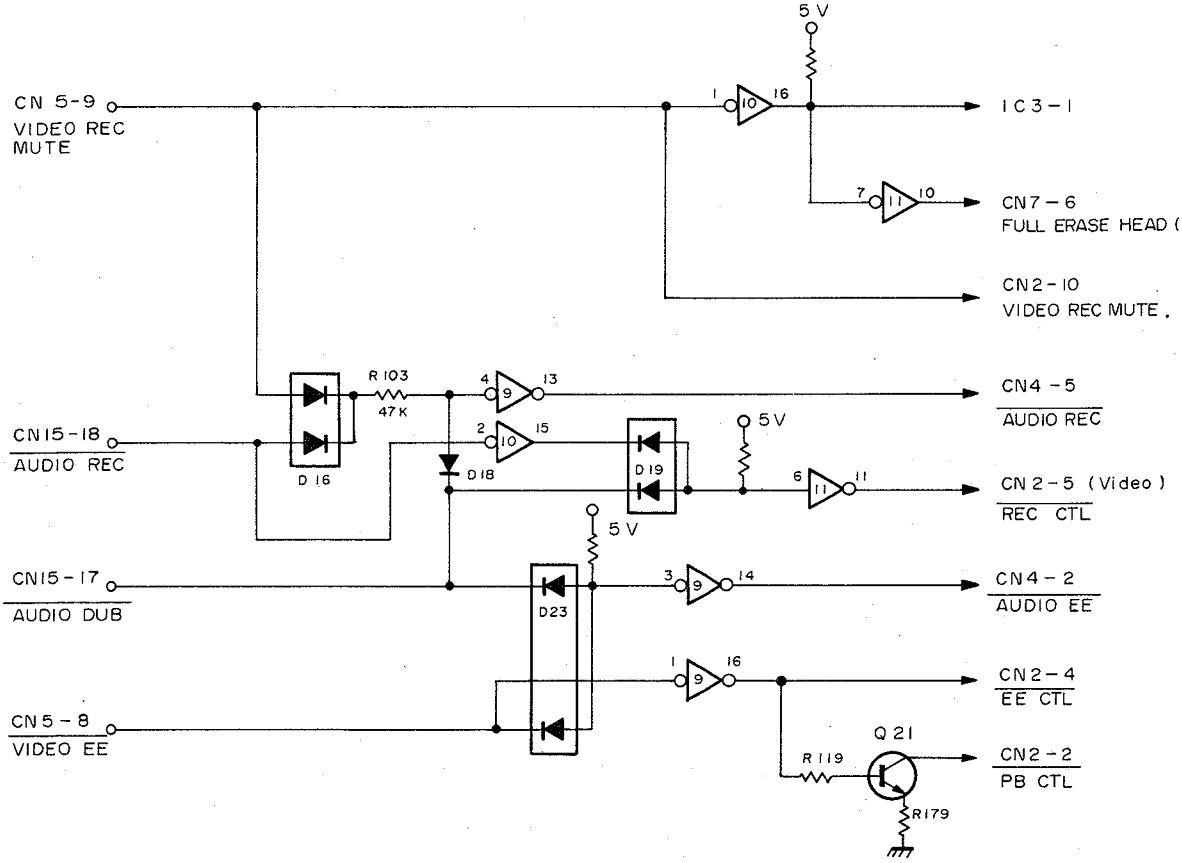

5 V
CN 5-9
VIDEO REC
MUTE
1
10
16
IC3-1
7
11
10
CN7-6
FULL ERASE HEAD (-)
CN2-10
VIDEO REC MUTE.
R 103
47K
4
9
13
CN4-5
AUDIO REC
CN15-18
AUDIO REC
D 16
2
10
15
D18
D19
5V
6
11
11
CN 2-5 (Video)
REC CTL
5 V
CN15-17
AUDIO DUB
D23
3
9
14
CN4-2
AUDIO EE
1
9
16
CN2-4
EE CTL
CN5-8
VIDEO EE
Q 21
R 119
CN2-2
PB CTL
R179

Fig. 3-50 A/V system control

the audio and video circuits are supplied from the mechacon circuit. These data are expanded to serve as control data for each circuit.

- Servo control

1) IC3 pin 1, 2 control
Pins 1 and 2 of IC3 serve as control line for mode change. With this input, mode change for Recording, Playback and Editing is performed.

2) IC3 pin 30, 31 control
This input controls the V pulse generator circuit inside IC3. Pins 30 and 31 of IC3 do not have any other function.

3) Q4 control
Q4 becomes ON during Search Rewind and Pause reversal, to fix the drum error voltage and lock the drum rotation.

4) D31, R176
During Search Rewind and Pause reversal, the capstan motor rotates at approx. 3 times the normal speed. The DC limiter contains the error voltage between 1.9 V and 3.1 V, but when the error voltage fluctuates within this range, undesirable irregular movement of noise bars results. In order to prevent this, D31 is caused to become ON and a high voltage potential is supplied to the DC limiter circuit via R176. Thereby the voltage during Search Rewind is fixed at the DC limiter's upper value of 3.1 V.

5) Operation of Q1 and Q3
During Search, these transistors become ON, for speed control during search and phase control during Search FF.
By causing Q3 to become ON during Search, the time constant of the CTL delay MMV inside IC3 is adjusted and the playback CTL pulse is counted down to 1/3.

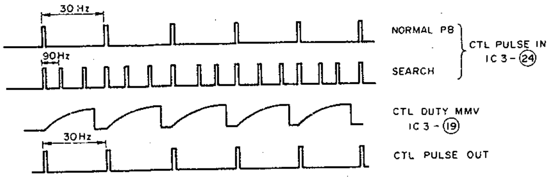


Fig. 3-51 Search CTL counter

6) Operation of C56
During Search Rewind, C56 causes IC11 pin 12 to become Low, which results in a small tilt change of the trapezoidal waveform, reducing the drum speed in Search Rewind. The addition of C56 causes a relative speed reduction of approx. 2.3%.

7) Operation of Q10
During Reverse, Q10 becomes ON for the approx. 200 msec interval of the solenoid drive pulse. The capstan motor rotation is reversed by potential determined by R137, resulting in a breaking effect on the motor.

8) Compensation of Relative Speed during Search
The relative speed changes by approx. 0.6% when the tape speed is doubled. Therefore, the relative speed during Search FF changes by (3 − 1) x 0.6 = 2 x 0.6 = 1.2%. Relative speed is reduced by 1.2%. Because this is only a minor change in comparison to the approx. 5% of conventional search modes with tenfold speed, the HR-C3 does not employ relative speed adjustment for Search FF. However, during Search Rewind the relative speed change becomes [(−3) − 1] x 0.6 = 4 x 0.6% = 2.4%. Therefore, the HR-C3 provides compensation of relative speed change for Search Rewind only.

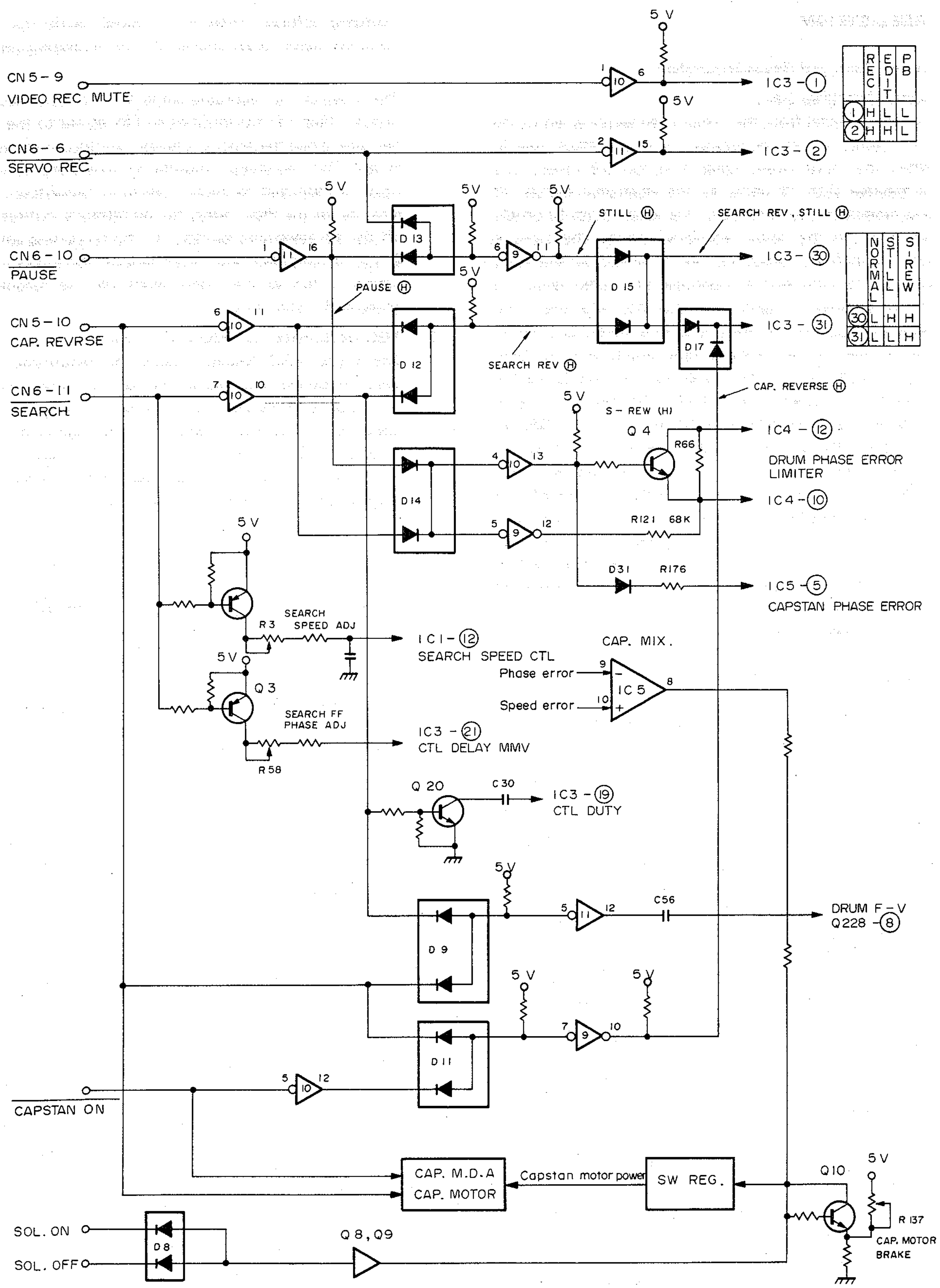

CN5-9
VIDEO REC MUTE
CN6-6
SERVO REC
CN6-10
PAUSE
CN5-10
CAP. REVRSE
CN6-11
SEARCH
CAPSTAN ON
SOL. ON
SOL. OFF
5V
IC3-①
IC3-②
REC
EDIT
PB
① H L L
② H H L
STILL Ⓗ
SEARCH REV, STILL Ⓗ
PAUSE Ⓗ
SEARCH REV Ⓗ
CAP. REVERSE Ⓗ
IC3-㉚
IC3-㉛
NORMAL
STILL
S-REW
㉚ L H H
㉛ L L H
D 13
D 12
D 14
D 15
D 17
D 9
D 11
D 8
S-REW (H)
Q 4
R66
IC4-⑫
DRUM PHASE ERROR LIMITER
IC4-⑩
R121 68K
D31
R176
IC5-⑤
CAPSTAN PHASE ERROR
SEARCH SPEED ADJ
R3
IC1-⑫
SEARCH SPEED CTL
CAP. MIX.
Phase error
Speed error
IC 5
Q 3
SEARCH FF PHASE ADJ
R 58
IC3-㉑
CTL DELAY MMV
Q 20
C 30
IC3-⑲
CTL DUTY
C56
DRUM F-V
Q228-⑧
CAP. M.D.A
CAP. MOTOR
Capstan motor power
SW REG.
Q10
R 137
CAP. MOTOR BRAKE
Q 8, Q9

Fig. 3-52 Servo system control

.3 VIDEO SYSTEM

.3.1 Luminance signal Recording system

1. Signal Flow (Fig. 3-57)

   The video signal from the camera connector is fed to the Y/C circuit via the mechacon, servo and MDA boards. When the input video signal is in the E-E mode, it is terminated with 75 ohms by the electronic switch Q2 and branched into two lines. One leads to pin 16 of IC7 for input to the color recording circuit. The other is sent to an AGC circuit via pin 21 of IC6. At the AGC circuit, the sync level is controlled at a fixed value and the video signal is again separated into two lines. One leads through the E-E amp, electronic switch and pin 31 and is sent to the video output circuit as E-E signal. (For explanation of the video output circuit, see the section on playback signal flow.) The other line signal leads through an electronic switch and pin 17 to IC5, pin 2. After passing the emitter-follower inside IC5, the signal is fed from pin 7 of IC5 to the low-pass filter (LPF) 2. The color signal components are removed, and the lumiance signal components only are obtained. LPF 2 and EQ3 serve to improve the pulse characteristics of the luminance signal. The luminance signal is amplified inside IC6 and branched into 3 lines after passing an electronic switch.

   One line leads to the sync separation circuit. The second line passes a clamp circuit and is supplied to the AGC detector circuit. The main signal is sent to IC2 from pin 7. This luminance signal enters IC2 at pin 13. Its sync tip is clamped by the clamp circuit and then the signal enters a nonlinear emphasis circuit. This circuit automatically varies the amount of pre-emphasis applied, according to the level of the input video signal.

   At low signal levels, where noise is most apparent, the amount of pre-emphasis is increased. In conjunction with the following main emphasis circuit, this serves to improve S/N ratio in the mid and high frequency regions of the signal. The main emphasis circuit applies a constant amount of pre-emphasis with every signal level, but an apparent compression of spike components is achieved by demodulating the spike components in the white/dark clipping circuit output and adding these to the signal. Thereby the spike components can be demodulated in playback, and pulse characteristics are improved.

   In the white/dark clipping circuit, sudden spike components of the luminance signal beyond a certain level (i.e. overshoot and undershoot components) are clipped. Then the luminace signal is converted in the FM modulator circuit into an FM signal with sync tip of 3.4 MHz and white peak of 4.4 MHz. The FM modulated luminance signal is routed through a high-pass filter attenuating those frequencies in the FM signal's lower sideband which are in the same region as the down-converted color signal. After passing through an emitter-follower, the signal is adjusted by R13 to the optimum recording voltage. Then it is mixed with the down-converted color signal and fed to the recording amplifier 1.

   The input of the recording amplifier 1 has an electronic switch which permits input of an FM signal to the amplifier only when the tape is actually running in the Record mode. The recording amplifier's frequency characteristics are adjusted to obtain optimum recording characteristics. In the Play mode, the amplifier's output is cut off by the electronic switch Q1. The recording amplifier 2 is a flat amplifier with SEPP circuit configuration. Its output is fed to the video heads via the preamplifier board and rotary transformer.

2. AGC (Automatic Gain Control) circuit

   The keyed AGC system detects the amplitude of the sync component and adjusts the gain in order to obtain the required amplitude. An advantage of the keyed AGC design with respect to a peak detecting type AGC, is that it restores the video level to its intended original level.

   The basic principle is illustrated in Fig. 3-53, block diagram and corresponding waveforms.

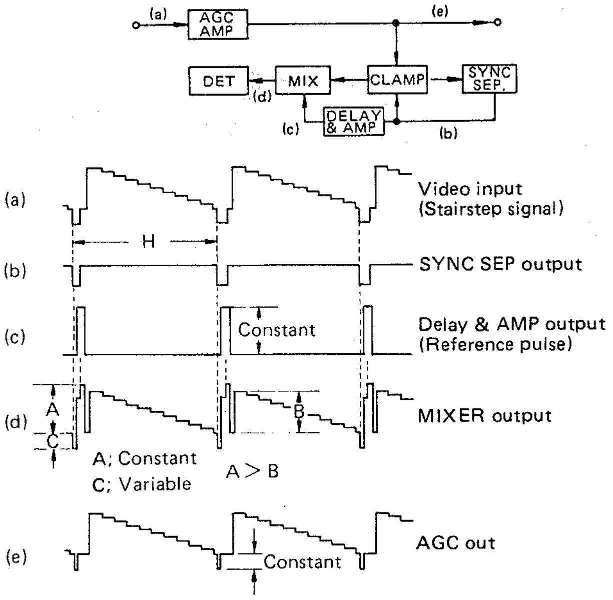


Fig. 3-53 AGC circuit

3.3.2 Luminace signal playback system

1. Signal Flow (Fig. 3-57)

In the Playback mode, Q1 on the preamplifier board is ON and Q2, Q3 are OFF. Thereby the playback signal from the video heads is fed to the preamplifier. After being amplified by the separate preamplifiers CH-1 and CH-2, the playback signal is joined into a continuous signal by a mixing circuit and electronic switch which is controlled by the drum flip-flop signal from the servo board. This signal is fed to the Y/C board from pin 8 of CN1. After entering the Y/C board, the playback signal is separated into two lines. The first line goes to the color signal playback circuit, and the second line to the emitter-follower Q4 for demodulation of the luminance signal. The output of Q4 is routed through a high-pass filter inside IC3, where the unnecessary low-band color signal is removed. Then an equalizer amplifier performs frequency compensation to obtain flat playback signal characteristics. The output of the equalizer amplifier is fed to the FM AGC circuit of IC2 via EQ1. EQ1 serves especially to improve the start-up pulse characteristics. The AGC circuit is required to ensure correct operation of the following DOC (dropout compensator) circuit. Dropouts are due to imperfections in the tape, etc. and cause a momentary loss of FM signal. When this occurs, the DOC circuit inserts the FM signal from the previous horizontal scanning line (1 H), to produce a dropout-free FM signal. The DOC output passes the DOC network inside IC3 and is sent to the limiter circuit in IC6. The signal from IC3, pin 7 which passes the delay line DL1 and is returned to IC2, pin 18 consists the signal for replacement by the DOC.

The limiter circuit has a gain limit of approx. 80 dB, to permit correct operation of the demodulator and prevent black/white reversal.

The demodulator is a delay-type, phase-detecting detector. The demodulator output is sent to the low-pass filter LPF1 via the emitter-follower inside IC5. The detector output from the demodulator is integrated at LPF1 to become the original demodulated video signal. At the same time, FM carrier leak and the frequency range of the playback color signal is attenuated. EQ2 delays the luminance signal to match the timing of the color signal at the playback output. LPF1 and EQ2 serve to improve the pulse characteristics of the playback luminance signal. The output of EQ2 is returned to IC5, and the response in the 2-MHz vicinity is improved by an equalizer amplifier. The de-emphasis circuit restores the original frequency response by attenuating the high frequencies with characteristics opposite to those of the main emphasis circuit in the recording system. This serves to reduce the high-frequency noise inherent in frequency modulation. The level of the playback luminance signal is adjusted at R25 and via an emitter-follower and pin 5 of IC6, it is fed to the nonlinear de-emphasis circuit. This circuit compensates for the nonlinear pre-emphasis applied during recording. A noise-limiter circuit attenuates high-frequency noise which includes carrier leak, and improves S/N ratio.

After the noise-limiter circuit, the signal passes a clamp circuit and a squelch circuit and then is combined with the playback color signal in the Y/C mixer circuit. This output appears at pin 31. During Shuttle Search and Still Playback, noise is introduced in the vertical sync signal which can disturb correct synchronization. In order to achieve stable synchronization, a v-pulse signal is supplied to pin 28 from the servo circuit and added to the squelch circuit.

The video signal from IC6, pin 31 is supplied to IC9, pin 6. Its sync tip is clamped by a clamp circuit, and then it is fed to the output amplifier. One output of the output amplifier is converted to low impedance by an emitter-follower, passes through R50, pin 2 of CN1 and the servo board, and is sent back to pin 1 of the camera connector mounted on the mechacon board. This is the picture signal for the viewfinder monitor on the camera. Because pin 1 serves for input as well as output, in the Recording mode (E-E mode) the output is cut by an electronic switch. The output signal during playback is fed out along with a DC voltage which serves for switching the viewfinder in the camera.

Another output from the output amplifier is of low impedance and branched into two lines from pin 9 of IC9. One line is fed from pin 6 of CN1 to the video output terminals on the servo board via a 75-ohm impedance. The other line is adjusted to TV standard chracteristics at EQ6 and sent to the RF converter via an emitter-follower inside IC9. The RF converter is switchable for high or low channel. The RF converter output is sent to the RF output terminals on the servo board.

2. Dropout compensator

Defects in the tape, such as magnetic particle losses, can cause loss or reduction of the FM signal, which may impair picture quality. When this occurs, the dropout

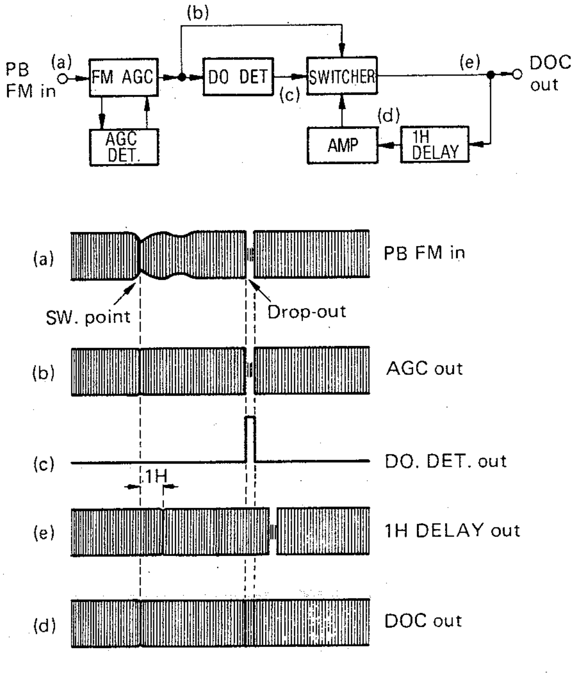


Fig. 3-54 Dropout compensator

compensator functions to insert the FM signal from the previous horizontal line, thereby preventing visible effects in the picture.

The FM AGC circuit first corrects for level fluctuations in the playback FM signal, which arise from variations in head to tape contact at the intake and outpout of the rotating drum. This result in a fixed level as indicated by waveform (b) in Fig. 3-54.

Part of this output goes directly to the switching circuit, while another part is applied to the dropout detector. In the dropout detector circuit, a highpass filter cuts the low side band of the FM signal and an integrator detects the dropout component. A precise squarewave is formed and supplied as waveform (c) to the switching circuit.

Part of DOC output is always supplied through a 1-H delay line (DL1) and an amplifier to the switching circuit. When a dropout occurs, the waveform (c) becomes high and the switcher turns on. The delayed FM signal becomes inserted in place of the dropout component.

3. Demodulator circuit

Part of the signal from the limiter goes directly to the switching circuit as the switching pulse. In the other route the signal goes through a delay circuit, then to the switcher as waveform (b) in Fig. 3-55.

The delayed output through the inverter enters the switcher as waveform (c).

A low switching pulse (a) produces the switching circuit output shown by (b), while a high pulse results in (c). Consequently, the switching circuit output becomes as shown by waveform (d). This is integrated through a lowpass filter to yield the luminance signal indicated by (e).

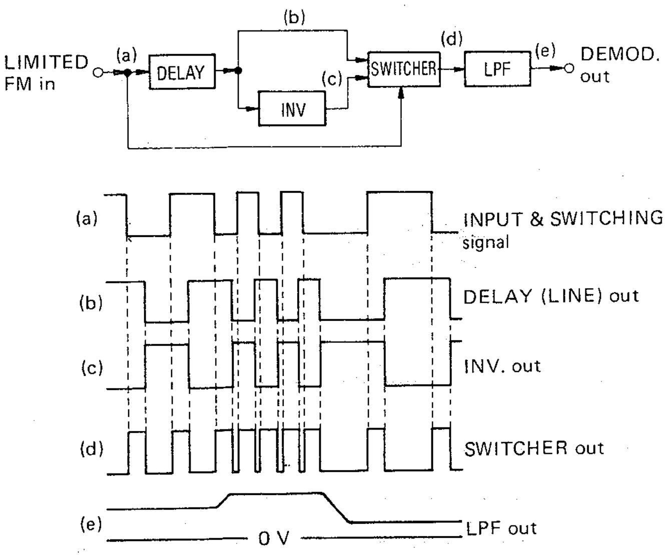


Fig. 3-55 Demodulator circuit

4. Noise Limiter circuit

P.B. signal reproduced from a recorded tape contains high frequency noise components. P.B. signal branches off in two ways; one to the mixing circuit directly and the other is sent to a high-pass filter that extracts its high frequency signal. As this high frequency signal contains the intelligence of rising-up and trailing of the signal, components whose levels are over the noise level is removed by the cripping circuit of the next step. Consequently, the waveform (c) is only of noise component, and then the waveform (d) of phase-converted will be added to the original P.B. signal at the mixing circuit to put out P.B. signal containing no noise signal.

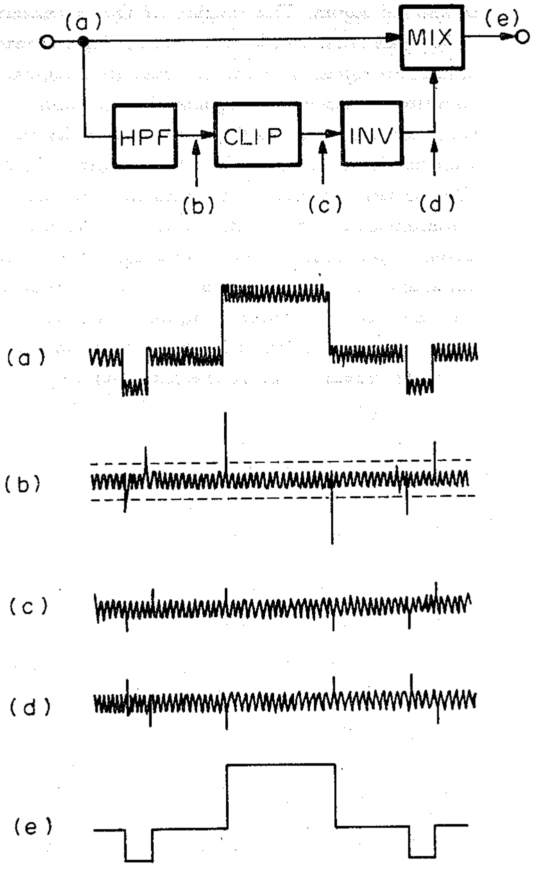


Fig. 3-56 Noise limiter circuit

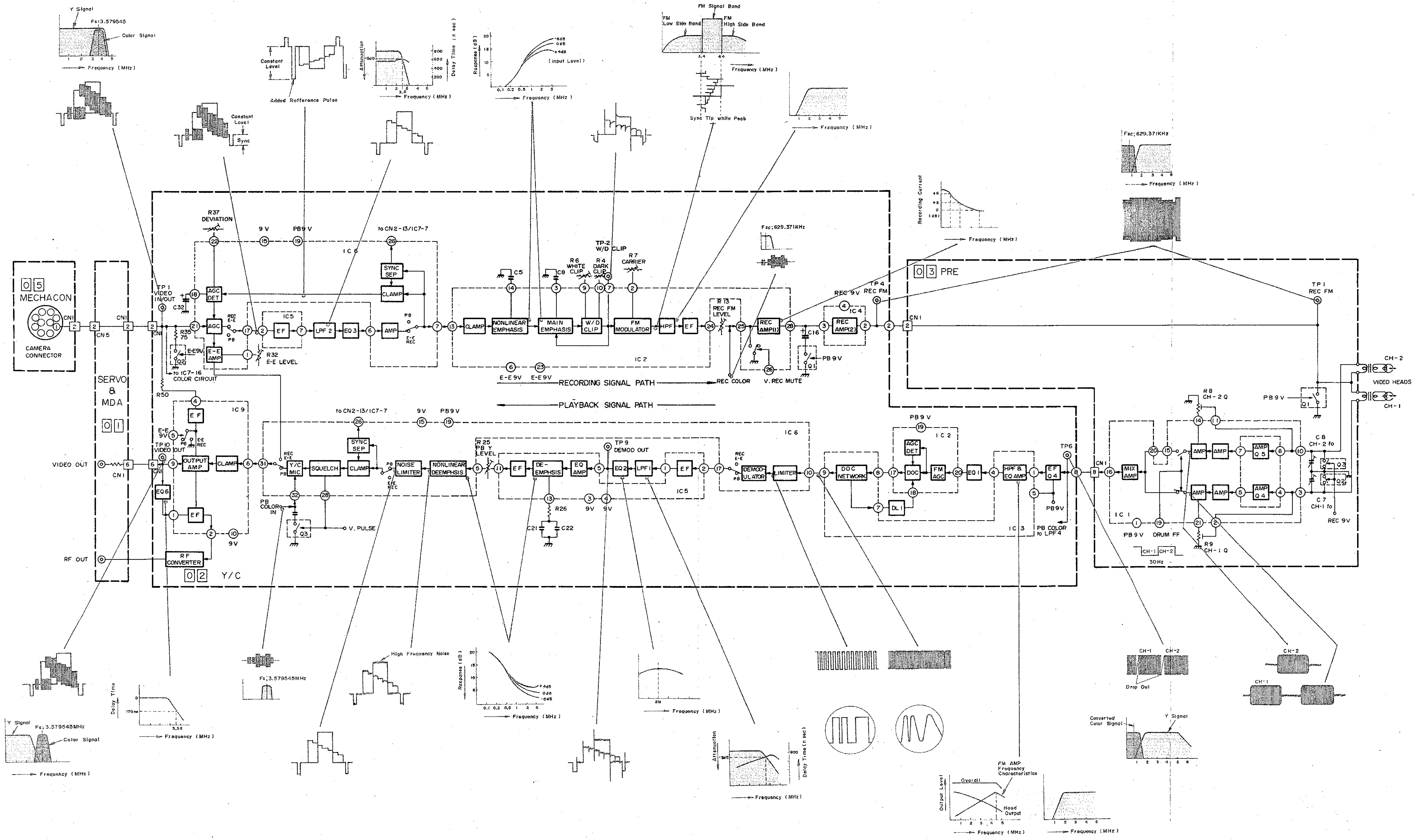

05 MECHACON
CAMERA CONNECTOR
SERVO & MDA
01
02 Y/C
03 PRE
VIDEO OUT
RF OUT
TP1 VIDEO IN/OUT
TP10 VIDEO OUT
R37 DEVIATION
AGC DET
AGC
E-E AMP
R32 E-E LEVEL
IC5
EF
LPF 2
EQ 3
AMP
SYNC SEP
CLAMP
IC6
IC2
NONLINEAR EMPHASIS
MAIN EMPHASIS
W/D CLIP
FM MODULATOR
HPF
TP-2 W/D CLIP
R6 WHITE CLIP
R4 DARK CLIP
R7 CARRIER
R13 REC FM LEVEL
REC AMP(1)
REC AMP(2)
IC4
TP4 REC FM
REC 9V
REC COLOR
V.REC MUTE
RECORDING SIGNAL PATH
PLAYBACK SIGNAL PATH
to IC7-16 COLOR CIRCUIT
to CN2-13/IC7-7
IC9
OUTPUT AMP
EQ6
RF CONVERTER
Y/C MIC
SQUELCH
NOISE LIMITER
NONLINEAR DEEMPHSIS
R25 PB Y LEVEL
DE-EMPHASIS
EQ AMP
EQ2
LPF1
TP9 DEMOD OUT
DEMODULATOR
LIMITER
DOC NETWORK
DL1
AGC DET
DOC
FM AGC
EQ1
HPF & EQ AMP
EF Q4
IC3
PB COLOR to LPF 4
TP6
PB COLOR IN
V. PULSE
MIX AMP
AMP Q5
AMP Q4
IC1
DRUM FF
R8 CH-2 Q
R9 CH-1 Q
C8 CH-2 fo
C7 CH-1 fo
TP1 REC FM
REC 9V
PB 9V
CH-2
CH-1
VIDEO HEADS
Y Signal
Fs:3.579545
Color Signal
Frequency (MHz)
Constant Level
Added Refference Pulse
Attenuation
Delay Time (n sec)
Response (dB)
(input Level)
FM Signal Band
FM Low Side Band
FM High Side Band
Sync Tip
white Peak
Fsc:629.371KHz
Recording Current
High Frequency Noise
Fs:3.579545MHz
Drop Out
Converted Color Signal
FM AMP Frequency Characteristics
Output Level
Overall
Head Output
30Hz

Fig. 3-57 Luminance signal block diagram

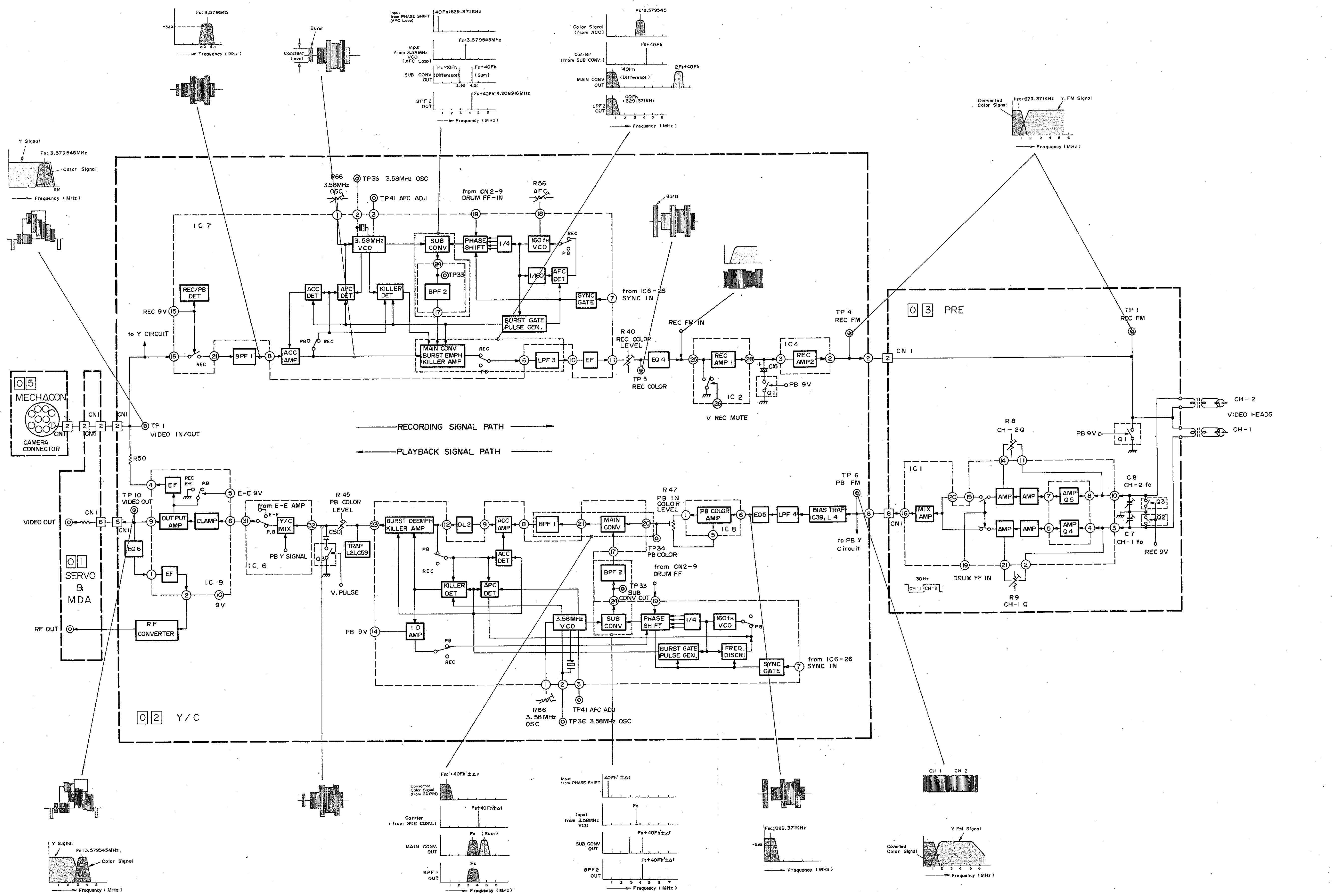

05
MECHACON
CAMERA CONNECTOR
CN1
CN5
01
SERVO & MDA
VIDEO OUT
RF OUT
02 Y/C
03 PRE
IC 7
REC/PB DET.
REC 9V
to Y CIRCUIT
BPF 1
ACC AMP
ACC DET
APC DET
KILLER DET
3.58MHz VCO
SUB CONV
BPF 2
PHASE SHIFT
1/4
160 fH VCO
1/160
AFC DET
SYNC GATE
BURST GATE PULSE GEN.
MAIN CONV BURST EMPH KILLER AMP
LPF 3
EF
R66 3.58MHz OSC
TP36 3.58MHz OSC
TP41 AFC ADJ
TP33
from CN2-9 DRUM FF-IN
R56 AFC
from IC6-26 SYNC IN
R40 REC COLOR LEVEL
TP5 REC COLOR
EQ 4
REC FM IN
REC AMP 1
IC 2
V REC MUTE
IC4
REC AMP2
C16
PB 9V
Q1
TP4 REC FM
CN 1
TP1 VIDEO IN/OUT
RECORDING SIGNAL PATH
PLAYBACK SIGNAL PATH
R50
EF
E-E 9V
TP 10 VIDEO OUT
OUT PUT AMP
CLAMP
EQ 6
IC 9
9V
RF CONVERTER
from E-E AMP
Y/C MIX
PB Y SIGNAL
IC 6
C501
Q3
V. PULSE
R 45 PB COLOR LEVEL
TRAP L21, C59
BURST DEEMPH KILLER AMP
DL2
ACC AMP
ACC DET
KILLER DET
APC DET
ID AMP
PB 9V
BPF 1
MAIN CONV
TP34 PB COLOR
BPF 2
TP33 SUB CONV OUT
from CN2-9 DRUM FF
3.58MHz VCO
SUB CONV
PHASE SHIFT
1/4
160fH VCO
BURST GATE PULSE GEN.
FREQ. DISCRI
SYNC GATE
from IC6-26 SYNC IN
R66 3.58MHz OSC
TP41 AFC ADJ
TP36 3.58MHz OSC
R 47 PB IN COLOR LEVEL
PB COLOR AMP
IC 8
EQ5
LPF 4
BIAS TRAP C39, L 4
TP 6 PB FM
to PB Y Circuit
TP 1 REC FM
PB 9V
R 8 CH-2 Q
IC 1
MIX AMP
AMP
AMP Q5
AMP Q4
C 8 CH-2 fo
C 7 CH-1 fo
REC 9V
Q2
Q3
DRUM FF IN
R 9 CH-1 Q
30Hz
CH-1
CH-2
VIDEO HEADS
CH-2
CH-1
REC
PB
E-E
Fs: 3.579545
Frequency (MHz)
Burst
Constant Level
Input from PHASE SHIFT (AFC Loop)
40FH: 629.371KHz
Input from 3.58MHz VCO (AFC Loop)
Fs: 3.579545MHz
SUB CONV OUT
Fs-40FH (Difference)
Fs+40FH (Sum)
BPF 2 OUT
Fs+40FH: 4.208916MHz
Color Signal (from ACC)
Carrier (from SUB CONV.)
Fs+40Fh
MAIN CONV OUT
40FH (Difference)
2Fs+40FH
LPF2 OUT
40FH: 629.371KHz
Converted Color Signal
Fsc: 629.371KHz
Y. FM Signal
Y Signal
Fs: 3.579545MHz
Color Signal
Converted Color Signal (from 20 PIN)
Fsc'; 40FH' ± Δf
Carrier (from SUB CONV.)
Fs+40FH' ± Δf
MAIN CONV. OUT
Fs (Sum)
BPF 1 OUT
Fs
Input from PHASE SHIFT
40FH' ± Δf
Input from 3.58MHz VCO
SUB CONV OUT
BPF 2 OUT
Fsc: 629.371KHz
CH 1
CH 2
Y FM Signal
Coverted Color Signal

Fig. 3-58 Color signal block diagram

3.3.3 Color signal recording system

1. Main Signal Flow (Fig. 3-58)
   The video signal from the camera connector is divided into two lines at the Y/C board. One line goes to the AGC circuit of the luminance signal recording system in IC6. The other line is supplied to pin 16 of IC7.

   In the Recording mode, the electronic switch is ON, and the input video signal passes the switch and is fed from pin 21 to the band-pass filter BPF1. Here the luminance signal is removed and only the chroma signal component with its main energy centered around the color subcarrier remains. This is fed to the ACC (automatic color control) amplifier via pin 8 of IC7. The ACC amplifier controls the level to achieve a constant burst level at the output. This output of the ACC amplifier is branched into two lines. One line passes an electronic switch and goes to the ACC detector, the APC detector and the killer detector. At the ACC detector the brust signal is extracted with a burst gate pulse from a burst gate pulse generator, and this level is used to control the ACC amplifier. The other signal line is sent to a circuit block made up of main converter, burst emphasis circuit and killer amplifier. To this circuit block, the ACC amplifier output as well as the subconverter output, the killer detector output and the burst gate pulse are also supplied.

   Therefore, the output signal is frequency converted with 3.58 MHz from the ACC amplifier and 4.21 MHz (3.58 MHz + 40 fH) from the subconverter, and the burst signal is amplified by 6 dB. With a black-and-white signal, no output is obtained. This output signal contains the sum and difference signal components. It is sent via an electronic switch and pin 6 of IC7 to the low-pass filter LPF3, where the difference signal component of 40 fH (629 kHz) only is extracted. This signal of 40 fH (629 kHz) goes to the emitter-follower inside IC7, the recording level is adjusted with R40, and then it is fed to EQ4, where its timing is adjusted to match the luminance signal. The adjusted signal is then mixed with the recording FM signal and supplied to the recording amplifier 1 via pin 25 of IC2. Signal flow from this point on is as described in the section on the luminance signal.

   The subconverter performs frequency conversion with the 40-fH signal from the AFC loop and the 3.58-MHz signal from the APC loop. Because the subconverter output contains the sum and difference signal components, the band-pass filter BPF2 is used to separate the sum component of 4.21 MHz (3.58 MHz + 40 fH) and supply it to the main converter.

2. AFC (Automatic Frequency Control)
   The AFC loop has the following 3 functions:
   1) Generation of 40-fH signal (40 x 15.734 kHz = 629 kHz).
   2) Phase shift of the 40-fH signal by 90° every 1 H.
   3) Phase compensation with the horizontal sync signal.

   The input video signal is sync separated at the sync signal separator circuit inside IC6 and the horizontal sync signal is sent to IC7, pin 7 from pin 26 of IC6. At the sync gate, the 1/2 H sync signal is cut off and only the H horizontal signal remains. This signal is sent to the burst gate pulse generator circuit and also to the phase shift circuit and the AFC detector circuit.

   The AFC detector circuit is the phase comparator of the AFC loop. Its reference signal is the horizontal sync signal and its comparison signal is an fH signal gained by counting down the output of a 160-fH VCO (voltage-controlled oscillator) by 1/160. The VCO oscillates with 160 fH (160 x 15.734 kHz). The 160-fH signal is sent to a 1/4 count-down circuit and to a 1/160 count-down circuit. The signal counted down by 1/160 becomes the fH signal which is phase-compared in the AFC detector circuit with the horizontal sync signal of the input video signal. Because the horizontal sync signal used as reference is constant, the error output is also constant and the 160-fH VCO is controlled at R56 (AFC) to oscillate exactly with 160 fH. The signal counted down by 1/4 from the 160-fH signal becomes the 40-fH signal which is fed to the phase shift circuit. The drum flip-flop signal and the H sync signal are also fed to the phase shift circuit. Its output is 40 fH. The phase of the signal to be recorded at the CH-1 head is advanced by 90° per 1 H, and the phase of the signal to be recorded at the CH-2 head is retarded by 90°. This 40-fH signal is sent to the subconverter circuit as the AFC output.

3. APC (Automatic Phase Control)
   The output from the ACC amplifier is also sent via an electronic switch to the APC detector circuit. The APC detector circuit is the phase comparator of the APC loop. Its reference signal is the burst signal from the ACC output, and its comparison signal is the 3.58 MHz VCO output. The phase error of these two signals with respect to the burst gate pulse is detected and resulting error voltage is fed to the 3.58 MHz VCO. Thereby the VCO produces a 3.58 MHz signal whose phase exactly matches that of the input color signal. This 3.58 MHz signal is sent to the subconverter.

3.3.4 Color signal playback system

1. Main Signal Flow (Fig. 3-58)

The playback signal is amplified at the preamplifier board and sent to the Y/C board from pin 8 of CN1 on the preamplifier board. Up to here, the signal flow is identical to the luminance signal playback system

The signal being fed to the Y/C board is sent to the luminance signal playback system on one hand, and to the low-pass filter LPF4 via a bias trap (C39, L4) on the other hand. The bias trap prevents leakage of the erase head current into the color signal playback system during audio dubbing. LPF4 attenuates the unnecessary luminance signal component and passes only the down converted color signal.

The timing of this playback color signal is matched to that of the playback luminance signal in EQ5. Then the playback color signal is sent to IC8 for amplification, and after level adjustment at R47, it is fed to the main converter. To the main converter the 3.58 MHz + 40 fH signal from the subconverter is applied as in recording, and the output is the original 3.58 MHz component. However, the actual playback signal includes errors on the time axis (frequency and phase errors) due to tape speed variations, irregularities in video head rotation, tape elasticity, etc. Therefore the down-converted playback color burst signal becomes Fsc' = 40 fH' ± Δf. fH' is expressed by fH ± Δh, which is frequency variation due to tape speed fluctuations. Large variations such as 40 fH' are compensated for by the frequency discriminator circuit, and small variations such as ± Δf, caused by rotational error of the video heads, tape elasticity, etc. are compensated for by the APC loop. These compensation signals control the 160-fH VCO and cause it to oscillate with 160 fH' ± 4Δf. This output is counted down by 1/4 and becomes 40 fH' ± Δf, which is sent to the phase shift circuit.

Corresponding to the recording process, the playback signal from the CH-1 video head is phase-shifted (advanced) by 90° per 1H, and the playback signal from CH-2 is phase-shifted (delayed) by 90° per 1H. The combined signal is then fed to the subconverter. As the subconverter receives a stable 3.58 MHz signal from the 3.58-MHz VCO, the subconverter output becomes (3.58 MHz + 40 fH' ± Δf) and (3.58 MHz − 40 fH' ∓ Δf). At the band pass filter BPF 2 the (3.58 MHz + 40 fH' ± Δf) component is extracted and sent to the main converter. Therefore, the main converter output becomes the sum and difference signal of the playback color signal of 40 fH' ± Δf and the output from BPF 2 (3.58 MHz + 40 fH' ± Δf). By passing this output through the band-pass filter BPF1, the difference signal of 3.58 MHz only, that is a stable color signal without phase or frequency errors, is obtained.

This playback color signal is then fed to the ACC amplifier. The ACC amplifier output becomes a fixed burst level, and color crosstalk is cancelled at DL2. The output from DL2 is branched into two lines. One line passes through an electronic switch and is fed to the ACC detector circuit, the APC detector circuit and the killer detector circuit as a comparison signal. The other line signal passes through a burst de-emphasis circuit where the burst signal level, which was raised by 6 dB in recording, is lowered by 6 dB to restore the original level.

This circuit also operates as killer amplifier circuit and performs killer action according to the output from the killer detector circuit. The color output appears at pin 23 of IC7, and is routed through a trap circuit consisting of L21 and C59, where the unnecessary sum component leakage (3.58 MHz + 80 fH) of the main converter output is attenuated. R45 adjusts the playback color level, and then the signal is fed to pin 32 of IC6.

In a mixer circuit, this signal is mixed with the luminance signal and becomes the playback video signal. The signal flow from this point on is the same as for the luminance signal playback system.

2. Frequency Discriminator circuit

Fig. 3-59 shows the block diagram and the property of the frequency discriminator circuit.

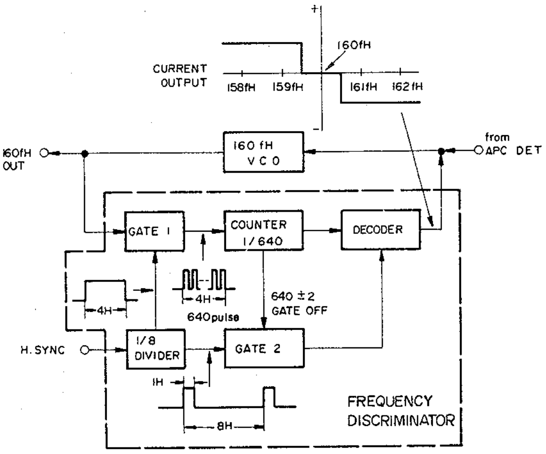


Fig. 3-59 Frequency discriminator circuit

The frequency discriminator circuit counts VCO output of 160 fH, and if the frequency becomes different by ±1/2 fH or more from the normal, this circuit puts out a signal to control 160 fH VCO output. In practice it counts 160 fH VCO of 4H period and 160 fH is equal to 640 pulses and 1/2 fH is 2 pulses. 160 fH VCO output is sent to the counter circuit through the gate 1 for the periof of 4H. The gate 1 is also supplied with 4H gate pulse from the 1/8 divider circuit. The number of pulse for this 4H period is 640 ± n.

The counter circuit counts 640 ± n pulses of 4H period and puts out 2 kinds of signals. One is output of Low or High potential to be supplied to the decoder circuit and the potential is High when the number of pulses is more than 640 while Low in less than 640. The other is gate pulse to be supplied to the gate 2, and it also has two kinds of potential of H and L; H is in case of 640 ± 2 (638–642) pulses and L in other case. The gate 2 puts out the pulse of the 1/8 divider circuit to the decoder circuit when the gate pulse from the counter circuit is Low. Namely, this pulse operates the decoder circuit for 1H duration at intervals of 8H period. Consequently, as shown in Fig. 3-59, the output of the decoder is 3-value output; zero when the number of pulse is 640 ± 2 (160 ± 1/2 fH), when it is less than 638 (159.5 fH) the output is to be able to increase oscillation frequency of 160 fH VCO, while in case of more than 642 (160.5 fH) the output is to decrease the frequency. When the output is zero APC loop corrects it.

3. APC circuit

The phase comparator circuit is supplied with 3.58 MHz crystal oscillator output as the reference signal and P.B. color signal including phase deviation as the comparison signal. The error voltage is sent to 160 fH VCO to control it with the output of the frequency discriminator circuit.

3.4 AUDIO CIRCUIT

3.4.1 Outline

This model performs monaural audio recording and playback. Since the main portion of the audio system is contained within IC devices, composition becomes highly simplified.

Two audio inputs are provided: camera and microphone, with priority to the microphone input. Audio outputs are in four lines: line, RF, earphone jack and camera. If the earphone jack is employed, the output to the camera connector becomes inhibited.

The full erase head uses a special oscillator, which is mounted to the head.

3.4.2 Recording signal flow

Both audio input lines are routed to the mechacon board. The –20 dBs signal from the camera connector is attenuated to –67 dBs by mechacon board R4 and R5, then sent via the microphone jack to the audio board. When a microphone is connected, the signal from the camera connector becomes cutoff and the microphone signal goes to the audio board.

The audio signal from the mechacon board is amplified 35 dB by the microphone amplifier of IC1. R1 adjusts this signal to –6 dBs at the audio output terminal, which goes to the recording line amplifier. The signal is amplified 19 dB and after lowpass filter L1, it is branched into two lines.

The first goes via IC1 pin 20 to the output amplifier, where it is amplified 30 dB to 0 dBs. This is sent to the AGC circuit, and at the same time, from pin 18 and CN5 pin 9 to the servo board as the audio output.

At the servo board, the signal is distributed to a) the RF converter of the Y/C board, b) the audio output jack at –6 dBs through a resistance divider, and c) the earphone jack and camera connector via the mechacon board. When an earphone is connected, the signal to the camera connector becomes cutoff.

In the other signal route from L1, R4 adjusts the recording level and the signal goes via IC1 pin 21 to the recording amplifier. R16 and L2 of the recording equalizer boost the 13 kHz region by about 10 dB. The recording amplifier output is then mixed with bias and sent from CN2 pin 2 to the audio head.

R21 adjusts the level of the bias signal obtained from the IC2 and L4 oscillator circuit. When low potential appears at pin 3 of IC2, oscillation is performed at approximately 65 kHz. The oscillator output is also supplied to the audio erase head.

The same IC is employed for the full erase head oscillator, which also functions when low appears at pin 3.

3.4.3 Playback signal flow

The signal picked up by the audio head goes via IC1 pin 1 to the playback equalizer amplifier, where it is amplified 30 dB. Equalization is performed by using negative feedback between pins 2 and 4.

The cancel signal from the servo board through CN5 pin 6 appears at IC1 pin 2. This serves to prevent the audio head from picking up the drum motor drive signal.

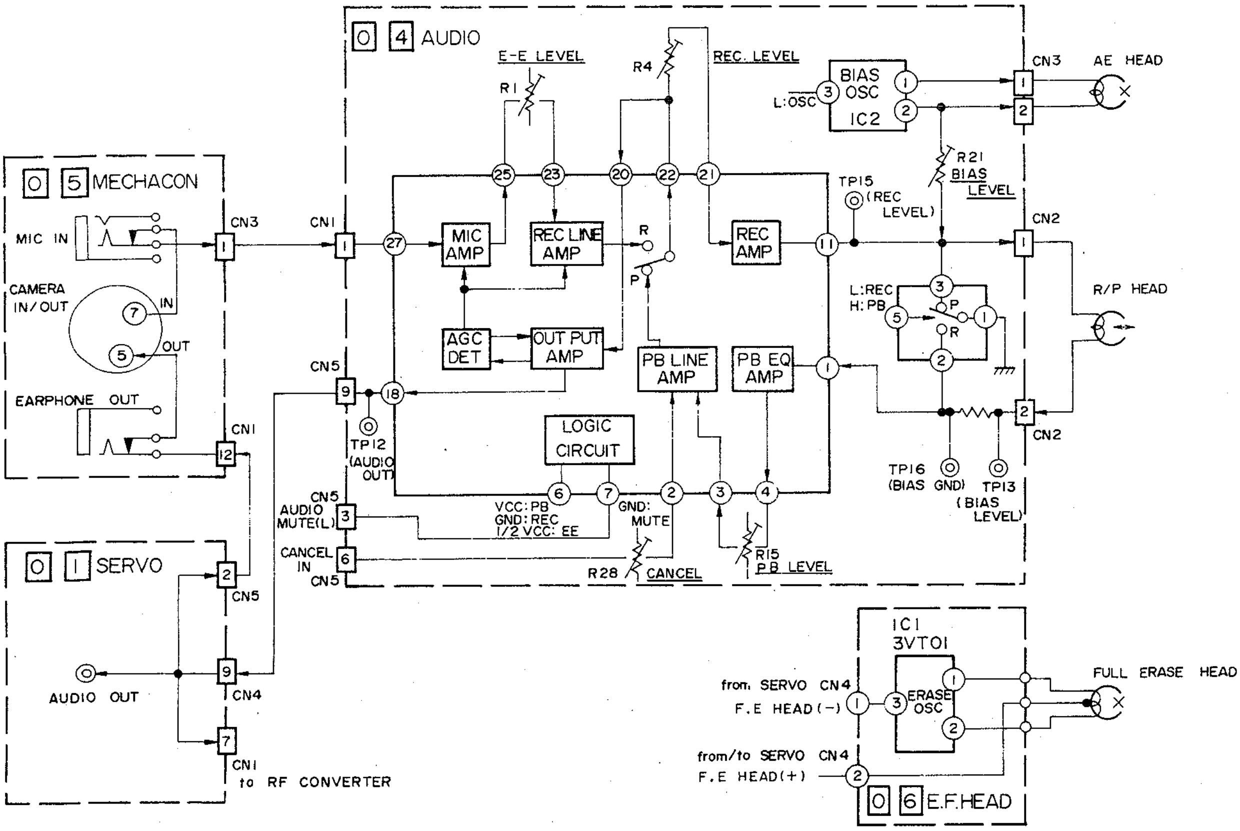
R15 adjusts the playback level of the pin 4 output signal. At the playback line amplifier, the signal is amplified 19 dB and appears at the pin 22 output. Afterwards, signal flow is the same as for recording, with the exception that the recording amplifier does not function.

3.4.4 Control circuit

The audio board also includes the control circuit. Potential at pin 6 sets IC1 for the recording or playback mode. When pin 6 is Vcc potential, the mode is playback, 1/2 Vcc yields the E-E mode, and low (ground) potential produces the recording mode.

Muting is controlled by IC1 pin 7. Low (ground) potential at pin 7 mutes the output and recording amplifiers.

Electronic switch IC3 selects the audio head mode. Low (ground) potential at pin 5 sets the recording mode.



0 4 AUDIO
E-E LEVEL
R1
R4
REC. LEVEL
BIAS OSC
IC2
L:OSC
CN3
AE HEAD
0 5 MECHACON
MIC IN
CAMERA IN/OUT
IN
OUT
EARPHONE OUT
CN3
CN1
CN1
MIC AMP
REC LINE AMP
R
P
REC AMP
TP15 (REC LEVEL)
R21 BIAS LEVEL
CN2
L:REC
H:PB
P
R
R/P HEAD
AGC DET
OUT PUT AMP
PB LINE AMP
PB EQ AMP
CN5
TP12 (AUDIO OUT)
LOGIC CIRCUIT
CN2
TP16 (BIAS GND)
TP13 (BIAS LEVEL)
CN5 AUDIO MUTE(L)
VCC: PB
GND: REC
1/2 VCC: EE
GND: MUTE
CANCEL IN CN5
R28 CANCEL
R15 PB LEVEL
0 1 SERVO
CN5
AUDIO OUT
CN4
CN1 to RF CONVERTER
IC1 3VT01
ERASE OSC
from SERVO CN4 F.E HEAD (−)
from/to SERVO CN4 F.E HEAD(+)
FULL ERASE HEAD
0 6 E.F.HEAD

Fig. 3-60 Audio block diagram

SECTION 4
MECHANICAL ADJUSTMENT

4.1 GENERAL

4.1.1 Precautions

IMPORTANT:

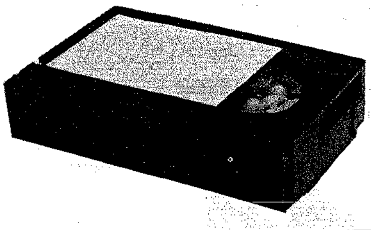
1. Disconnect from power before removing or soldering components.
2. When removing a screw from the chassis, be careful not to drop it into the mechanism. If a screw should be dropped, be sure to retrieve it.
3. Be extremely careful not to damage either the upper or lower head drum assemblies.
4. The tape transport mechanism has been precisely adjusted at the factory and ordinarily does not require readjustment.
5. When removing a part, be very careful not to damage or displace other parts. (Be especially careful with the guide poles and rotary video head drum.)
6. To operate the set with the cassette housing removed, close or short the terminals of the cassette switch. Also disable the photo transistor sensors by applying opaque covers. After completing checks and repairs, be sure to remove the covers.

4.1.2 Required jigs and tools

A: For proper mechanical adjustment, the following jigs and tools are strongly recommended. Without them, a long trial-and-error period would be necessary.

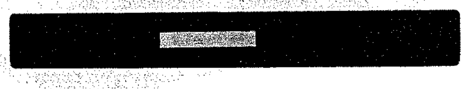
In addition, general-purpose tools and a metric hex key (not supplied by JVC) are required.
The hex key needed for this model is 1.5 mm size.

JVC Alignment Tape MH-C3

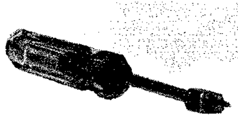


Tension arm tool PUJ43532-2

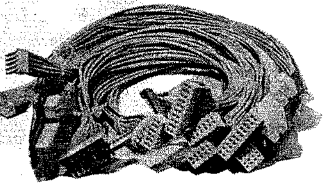
Cassette cover tool PUJ43638



A/C head position tool PUJ47351-2

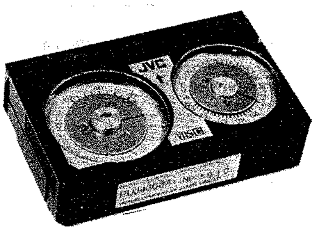


Patch cord set PUJ36480A



Allow circuit boards to be separated from chassis for more convenient checking and adjustments.

Cassette torque meter PUJ43637



Height gauge PUJ43545

Table 4-1 Jigs and tools for mechanical adjustment

NOTE: See section 5.1.1 Required test equipment and jigs regarding electrical adjustment.

.2 DISASSEMBLY

.2.1 External covers

1. Slide the eject knob downward to raise the cassette housing.

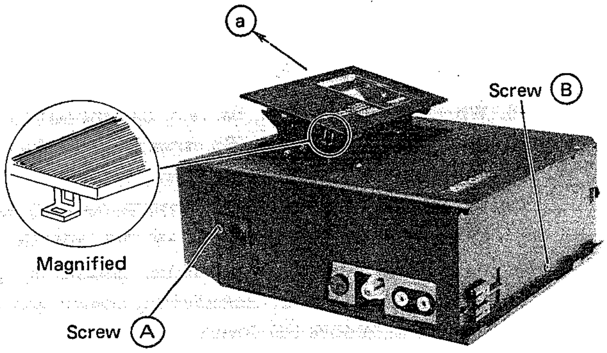

ⓐ
Screw Ⓑ
Magnified
Screw Ⓐ

Fig. 4-1

2. Spread the two cassette cover tabs (1 each left and right) outward and remove the cover in the direction ⓐ.
3. Take out two screws Ⓐ and remove the front cover.
4. Take out one screw Ⓑ. Slightly spread the forward portion of the top cover assembly and pull the assembly upward to remove. Use care not to damage the battery terminals.
5. Take out two screws Ⓒ (1 each left and right) and remove the bottom cover.

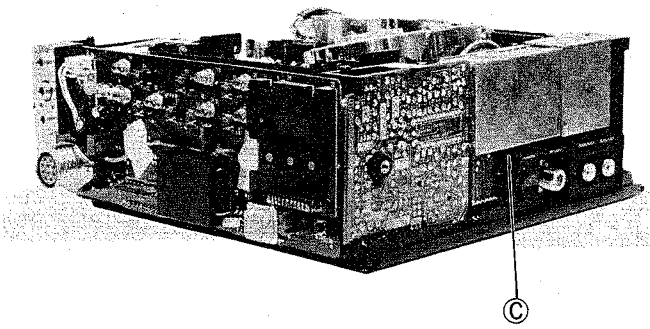


Fig. 4-2

NOTE: If the cassette housing cannot be raised, remove the external covers in the following manner.

1) The cassette cover is secured with four tabs as shown below.

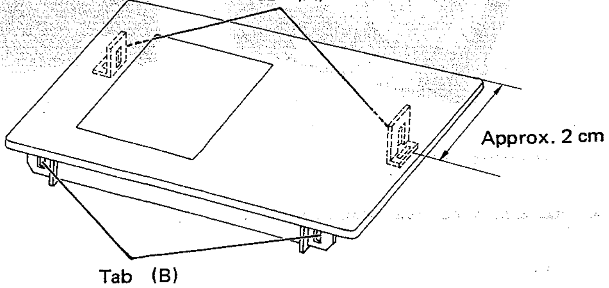

Tab (A)
Approx. 2 cm
Tab (B)

Fig. 4-3

2) Insert the cassette cover tool obliquely between the external covers as shown in the figure. Use care not to damage the covers.

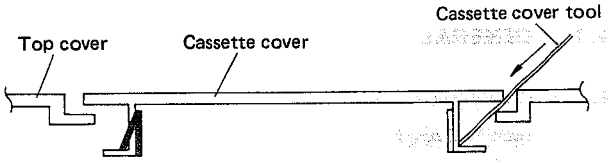

Cassette cover tool
Top cover
Cassette cover

Fig. 4-4

3) Carefully pry the tabs (A) free as indicated in Fig. 4-5.

4) Disengage tabs (B) and remove the cassette cover.

5) Remove the external covers; refer to Item 4.2.1.

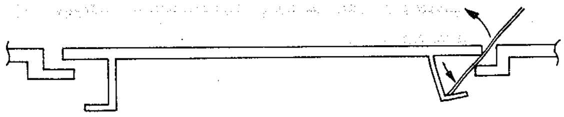


Fig. 4-5

4.2.2 Circuit board assemblies

If necessary to remove the servo & MDA board, first remove the Y/C, Switching Regulator, Audio and Mechacon boards.

Note: The circuit boards are connected by connectors. When removing, use care not to bend the boards, as this may cause faulty contact.

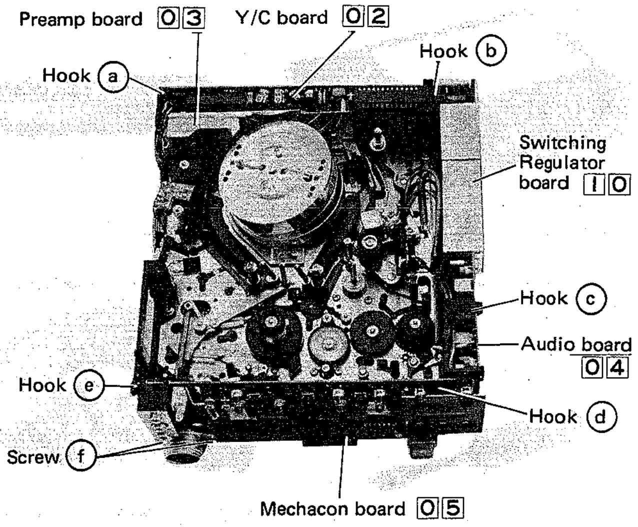

Preamp board 03
Y/C board 02
Hook ⓑ
Hook ⓐ
Switching Regulator board 10
Hook ⓒ
Audio board 04
Hook ⓔ
Hook ⓓ
Screw ⓕ
Mechacon board 05

Fig. 4-6

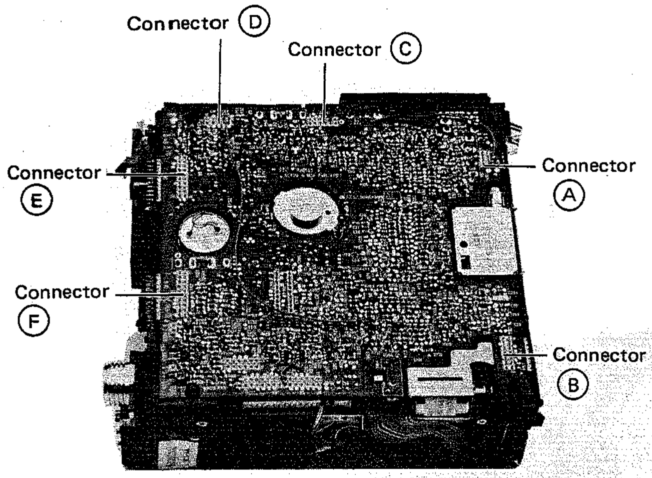

Connector Ⓓ
Connector Ⓒ
Connector Ⓔ
Connector Ⓐ
Connector Ⓕ
Connector Ⓑ

Fig. 4-7

1. $\boxed{0}\boxed{2}$ Y/C board
   Disengage hooks ⓐ and ⓑ indicated in Fig. 4-6.
   Disconnect connectors Ⓐ and Ⓑ, and remove the Y/C board.
2. $\boxed{1}\boxed{0}$ Switching Regulator board
   Disconnect connector Ⓒ and remove the Switching Regulator board. (Fig. 4-7)
3. $\boxed{0}\boxed{4}$ Audio board
   Disengage hook ⓒ shown in Fig. 4-6.
   Disconnect connector Ⓓ and remove the Audio board. (Fig. 4-7)
4. $\boxed{0}\boxed{5}$ Mechacon board
   Take out two screws ⓕ of the camera connector. (Fig. 4-6)
   Disengage hooks ⓓ and ⓔ.
   Disconnect connectors Ⓔ and Ⓕ, and remove the Mechacon board. (Fig. 4-7)
5. $\boxed{0}\boxed{1}$ Servo & MDA board
   Disconnect connectors Ⓖ and Ⓗ.
   Remove the Servo & MDA board. (Fig. 4-8)

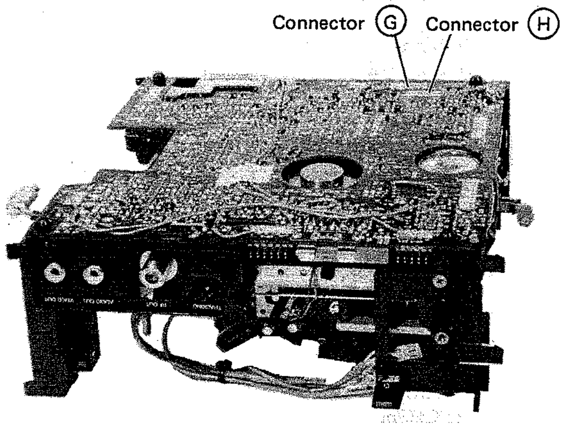

Connector Ⓖ
Connector Ⓗ

Fig. 4-8

6. $\boxed{0}\boxed{3}$ Pre-amp board
   1) Take out one screw Ⓐ and remove the shield plate.
   Disconnect the connector with the flexible cable. (Fig. 4-9)
   Detach the flexible cable from the shield case. At this time use care not to damage the flexible cable.
   2) Unsolder the points shown in Fig. 4-9 and remove the shield case.

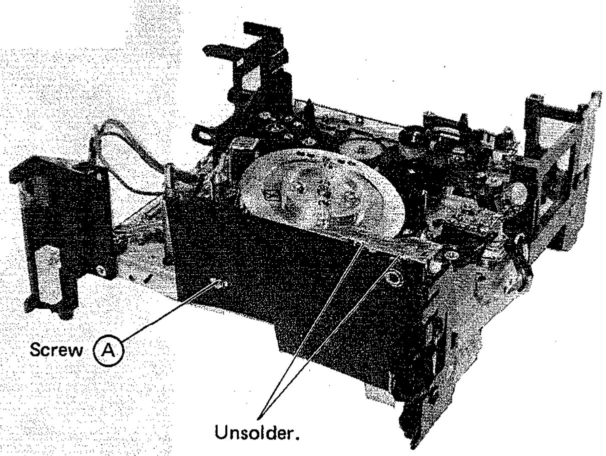

Screw Ⓐ
Unsolder.

Fig. 4-9

   3) Take out one screw Ⓑ and remove the Pre-amp board.

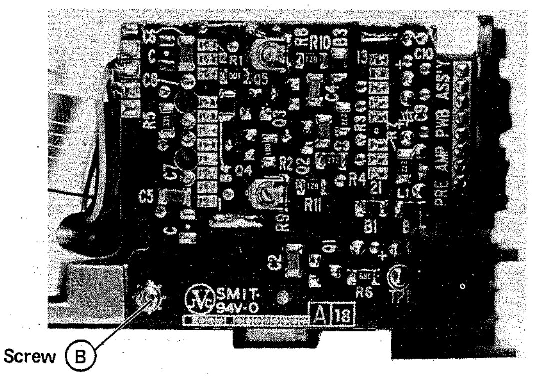

Screw Ⓑ
PRE AMP PWB ASSY
SMIT 94V-0
A18

Fig. 4-10

.3 LAYOUT OF MAIN MECHANICAL PARTS

.3.1 Top view and parts identification

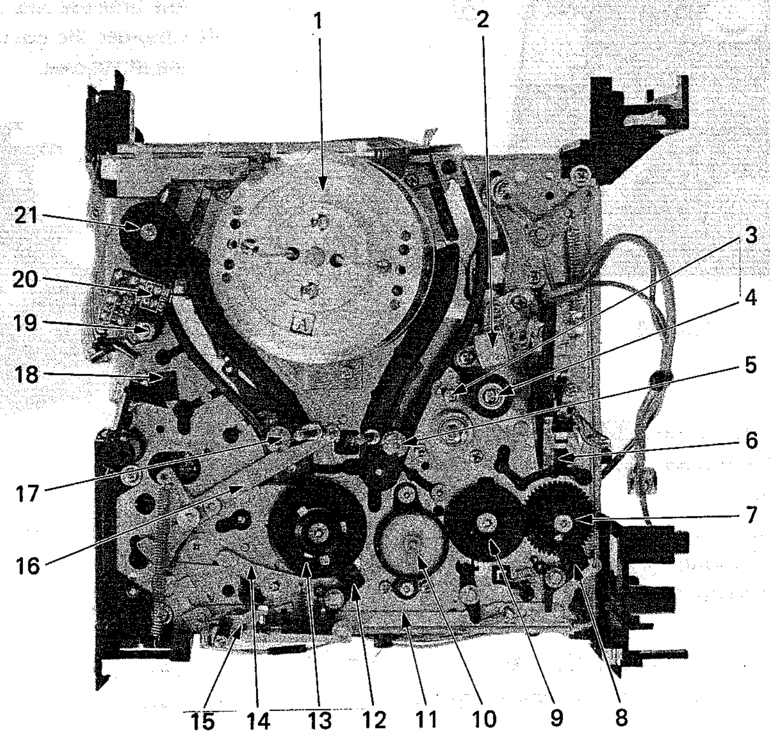


Fig. 4-11 Top view

Symbol No.	Part Name	Part No.
1	Upper Drum Assembly	PU33620A
2	Audio/Control Head	PU53065
3	Tape Guide	PU53629-2
4	Pinch Roller Assembly	PU53067A
5	Take-up Guide Roller Ass'y	PU53046A
6	Cassette Switch	PU52732
7	Take-up Gear	PU52991
8	Take-up Brake Arm Ass'y	PU53012A
9	Take-up Pulley	PU52992
10	Idler Arm	PU52990
11	Slide Lever Ass'y	PU53002B
12	Supply Brake Arm Ass'y	PU53015A
13	Supply Reel Disk	PU53000
14	Cancel Lever Ass'y	PU53017A
15	REC Safety Switch	PU53083
16	Tension Arm Ass'y	PU52997A
17	Supply Pole Base Ass'y	PU53044A
18	Dew Sensor	PU53091
19	Guide Pole	PU53058
20	Full Erase Head	PU53056
21	Roller Ass'y	PU53055A

Table 4-2

4.3.2 Bottom view and parts identification

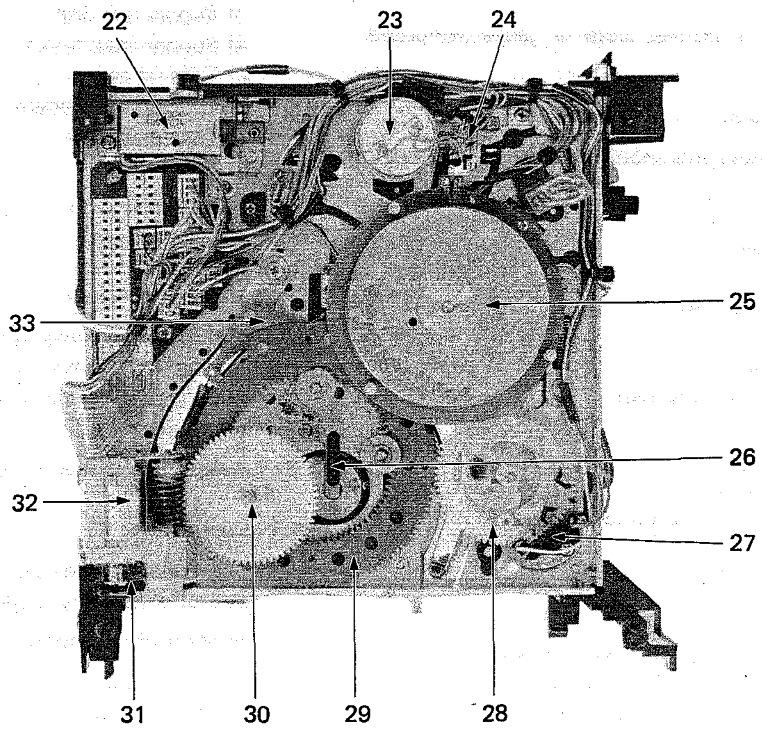


Fig. 4-12 Bottom view

Symbol No.	Part Name	Part No.
22	Brake Solenoid	PU53004
23	Reel Motor Ass'y	PU53585V
24	Solenoid Switch	PU53083
25	Capstan Motor	PU53066V
26	Brush	PU53092
27	Loading Switch	PU53088
28	Cam Gear	PU33551-2
29	Drive Ring Ass'y (L)	PU53024A
30	Worm Wheel Ass'y	PU53036A
31	Loading Belt	PUM30003-6
32	Loading Motor	PU53039V
33	Drive Ring Ass'y (R)	PU53021B

Table 4-3

4 PERIODIC MAINTENANCE

The following procedures are recommended for maintaining optimum performance and reliability of this video cassette recorder.

4.1 Cleaning

For cleaning, use a lint-free cloth or gauze dampened with alcohol.

A: Tape transport system

1. The following components should be cleaned after every 500 hours of use.
   1) Tension pole
   2) Supply guide pole
   3) Full erase head
   4) Supply impedance roller
   5) Supply guide roller
   6) Supply slant pole
   7) Video head and Drum system
   8) Brush
   9) Take-up slant pole
   10) Take-up guide roller
   11) Audio/control head and Audio erase head
   12) Tape guide
   13) Pinch roller
   14) Capstan
2. Since above parts come in direct contact with video tape, they tend to collect dust particles. If allowed to accumulate, dust may lead to damage to the video tape and above parts.
3. After cleaning with alcohol, allow the parts to dry thoroughly before using a cassette tape.

   NOTE:
   When cleaning the video heads on the upper drum, do not clean them with a vertical stroke.
   Use only a gentle back and forth motion in the direction of the tape path.
   Use care since they are easily damaged.
   When cleaning video heads, A/C head and erase heads, use a lint-free cloth dampened with alcohol.

B: Reel drive system

1. The following components should be cleaned after every 1,000 hours of use.

   – Upper section –
   1) Reel motor
   2) Reel idler
   3) Supply reel disk
   4) Supply main brake
   5) Take-up gear
   6) Take-up main brake
   7) Take-up pulley
   8) Idler arm

   – Bottom section –
   9) Loading gear
   10) Loading belt
   11) Loading motor
2. The above revolving parts are of rubber or come in direct contact with rubber parts.
   Rubber dust can accumulate and interfere with proper operation.
3. Avoid using excessive alcohol when cleaning rubber parts.

4.4.2 Lubrication

The following components should be lubricated with JVC oil after every 2,000 hours of use.

1) Shaft of the supply reel disk

After cleaning above shaft with alcohol, lubricate these shafts with one or two drops of JVC oil.
Do not over lubricate.

4.4.3 Service schedule for main components

The following chart lists the parts of the units which should receive periodic servicing at the recommended intervals.

Part Name	Part No.	Periodic Service Schedule (operating hours)				
		1 000	2 000	3 000	4 000	5 000
Upper Drum Assembly	PU33620A	●	●	●	●	●
Take-up Pulley Assembly	PU52992		●		●	
Reel Motor Assembly	PU53585V		●		●	
Capstan Motor Assembly	PU53066V		●		●	
Idler Arm Assembly	PU52990		●		●	
Take-up Gear	PU52991		●		●	
Tension Band Assembly	PU52993A		●		●	
Brush Assembly	PU53902		●		●	
Loading Belt	PUM30003-6		●		●	
A/C Head Assembly	PU53065			●		
Pinch Roller Assembly	PU53067A			●		
Loading Motor	PU53039V			●		
Supply Reel Disk Assembly	PU53000			●		
Full Erase Head	PU53056					●

Table 4-4 Standard service periods

● Replace.

NOTE:
Even if the unit is not used frequently, cleaning, lubrication and replacement of the belts should be undertaken every 2 years.

5 MAIN ASSEMBLY REPLACEMENTS

5.1 Cassette housing

1. With the cassette housing lowered, remove four screws (A) (2 each right and left).
2. Depress the eject lever to raise the cassette housing.
3. Because in this condition the eject lever still sticks through the rectangular cut-out in the mechacon board, the lever is caught by the board and prevents the cassette housing from being removed.
4. To remove the cassette housing, first lift it up in the rear and tilt it outwards to lift it off.
5. To reinstall the cassette housing, insert the eject lever from the left into the rectangular cutout in the mechacon board and place the cassette housing onto the set in the raised position.
6. At this time, make sure that the guides of the cassette housing bracket are firmly engaged in the rectangular cut-outs on the main deck.
7. Lower the cassette housing until it locks in place.
8. While lightly pulling the cassette housing arm, insert the four screws and tighten them in the order (a), (b), (c), and (d).
9. Insert a cassette tape and check that it can be set smoothly, is held firmly in place in the lowered position with no front/back, left/right or up/down instability, etc.

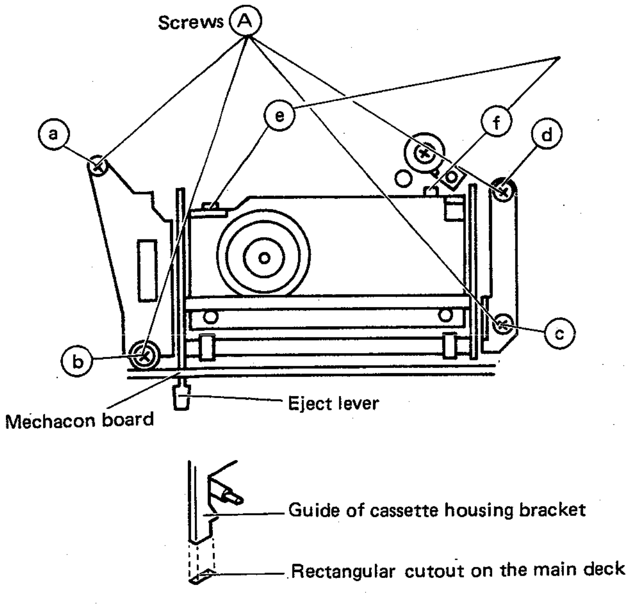

Screws (A)
a
e
f
d
b
c
Mechacon board
Eject lever
Guide of cassette housing bracket
Rectangular cutout on the main deck

Fig. 4-13

4.5.2 Upper drum

1. Unsolder the wires leading to the lower drum from the relay pins of the upper drum. (Perform this operation swiftly to avoid damaging the wires.)
2. Remove the screws and pull the upper drum assembly off in the upward direction for replacement.
3. Use alcohol to clean the lower face of the new upper drum assembly and the upper face of the lower drum.
4. Install the new upper drum assembly by reversing the above steps. During this process, take care not to directly touch the video heads or scratch the drum.

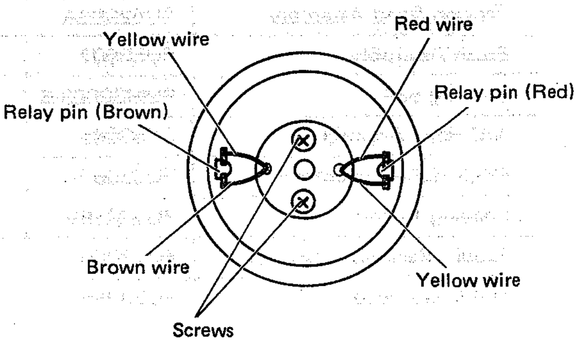

Yellow wire
Red wire
Relay pin (Red)
Relay pin (Brown)
Brown wire
Yellow wire
Screws

Fig. 4-14

4.5.3 Take-up gear assembly

1. In the ordinary condition, the lower take-up gear wheel is blocked by the take-up main brake and the rod (1), preventing the take-up gear from being removed.
2. Remove the slit washer (A) on top of the take-up pulley, and pull off the pulley in the upward direction, while paying attention to spring (B) and washer (C).

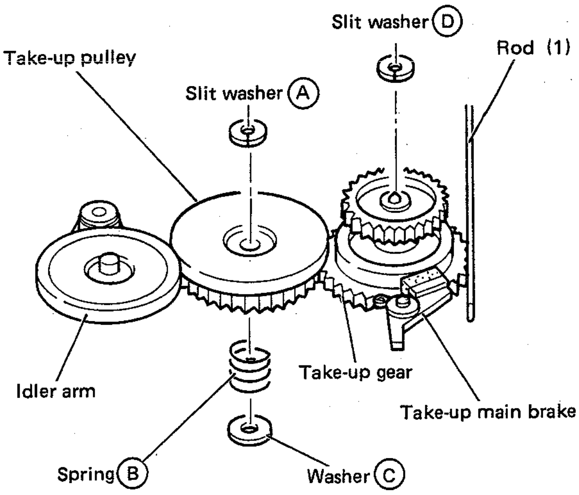

Slit washer (D)
Take-up pulley
Rod (1)
Slit washer (A)
Idler arm
Take-up gear
Take-up main brake
Spring (B)
Washer (C)

Fig. 4-15

3. Remove the slit washer (D) on top of the take-up gear, and pull off the gear in the upward direction, while pulling the take-up main brake outwards and paying attention to the rod (1).
4. Reassemble the take-up gear by reversing the above steps.

   Note: Be sure to clean the pulley before reassembling the take-up pulley and take-up gear.
5. After completing the reassembly procedure, check the take-up torque according to the following steps.
6. Insert the cassette torque meter into the cassette housing and set the unit to the playback mode.
7. Confirm that the pointer indication on the take-up side is 40 ± 10 g-cm.

4.5.4 Reel motor assembly/Idler arm

1. Before dismantling and replacing the reel motor assembly, note the ordinary condition of each part, as a reference for correct reassembly. Pay special attention to polarity and placement of the motor wires, attachment position of the motor band, etc.
2. Remove the wires from the reel motor. Remove screw (A) and pull the motor band off.
3. Remove screw (B) and remove the reel motor assembly for replacement.
4. Reassemble by reversing the above steps, while paying attention to motor wire polarity and motor band position.
5. After completing the reassembly procedure, perform "Reel Motor Voltage Adjustment (Mechacon Board)" as described in the section "Electrical Adjustments".
6. For replacement of the idler arm, remove the slit washer (C) of the idler arm and pull off the arm in the upward direction.
7. Before reinstalling the idler arm, perform cleaning of the rubber section.
8. After reasssembly, use the cassette torque meter to confirm that take-up torque is 40 ± 10 g-cm.

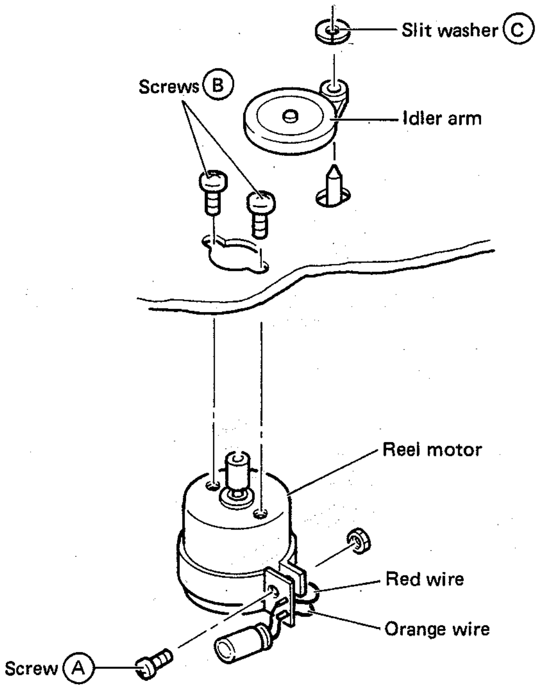


Fig. 4-16

4.5.5 Loading motor

1. Disconnect the 12-P cap housing from the junction board, while paying attention to the flexible board.
2. Turn the loading gear by hand to bring the pole base to about midway loading position.
3. Remove screws (A) and remove the loading gear assembly.
4. Remove the wires from the loading motor, and remove the loading belt.
5. Remove hex screw (B) from the motor pulley, and remove the pulley from the loading motor.
6. Remove screws (C) from the motor bracket, and remove the loading motor for replacement.
7. Reassembly of loading motor and loading gear assembly is performed by reversing the above steps. Before installing the loading gear assembly, the loading ring must be brought into the loading end position.

   Note: It is very important that the loading gear and the loading ring are properly engaged.
8. Turn the loading gear by hand and confirm that the supply and take-up pole bases reach the pole guides on top of the drum assembly at approximately the same time. If not, the loading gear assembly's mounting position must be corrected.

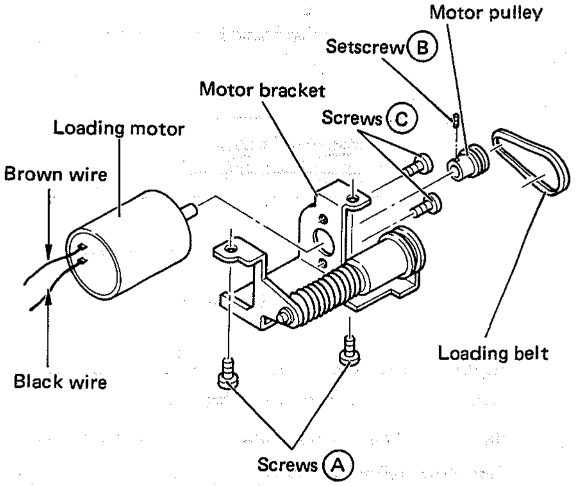


Fig. 4-17

5.6 Audio/control head assembly

1. Remove screws (A), (B) and (C).

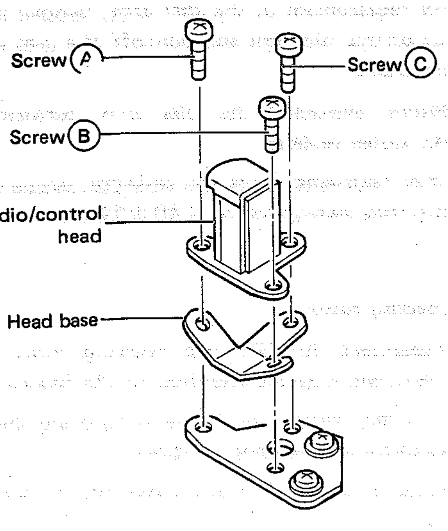


Fig. 4-18

2. Remove the audio/control head circuit board, and replace the audio/control head assembly.
3. Reattach the audio/control head assembly by reversing the above steps. Take care that the A/C head height approximately matches the tape travel path.
4. Perform tape transport adjustment according to the following steps.
   1) Mount the A/C head adjustment collar onto the tape guide.
   2) Insert a cassette tape (to be used for own recordings) and set the unit to the playback mode.
   3) Adjust screw (B) for smooth tape transport at the tape guide.

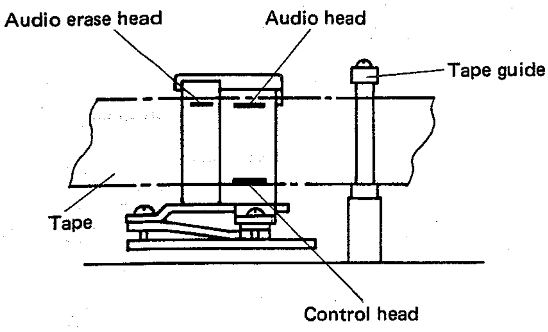


Fig. 4-19

5. Perform adjustment of A/C head height and azimuth, according to the following steps.
   1) Play back the 7-kHz audio signal of the alignment tape (stairstep signal section).
   2) Turn screws (A), (B) and (C) in succession by small and equal increments, until the audio output becomes maximum. Then use screw (A) as a reference and adjust the A/C head tilt with screw (B) and the audio azimuth with screw (C).
   3) Repeat these adjustments until the A/C head height is as shown in Fig. 4-19 and audio level fluctuations are at minimum.

   Note: ● In order to perform correct adjustment and protect the alignment tape from damage, screw (A) used as reference should not be turned by more than one quarter-rotation at a time.

   ● After screw (B) was turned, the audio azimuth must always be adjusted with screw (C).

4.5.7 Tension arm assembly

1. Remove the slit washer on top of the supply reel disk, and remove the supply reel disk assembly by pulling it off in the upward direction.
2. Turn the loading motor by hand to bring the pole base into the loading end position.
3. Remove spring (A).
4. Remove the slit washer (B) from the tension arm, remove the tension band adjustment screw (C), and pull off the tension arm assembly in the upward direction, while paying attention to the washer, tension band and cancel lever assembly.
5. Remove the slit washer (D) below the tension arm, and replace the tension band.
6. Reattach the tension band assembly and reel disk assembly by reversing the above steps.

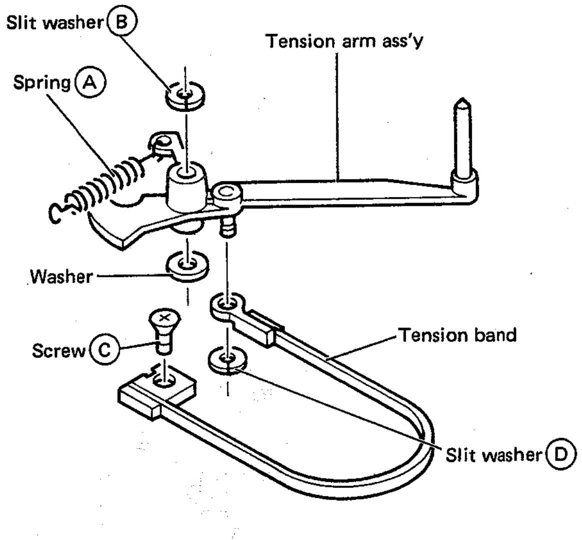


Fig. 4-20

7. After completing the reassembly procedure, perform adjustment of the tension pole position according to the following steps.
   1) Block the light from reaching the end sensor and short-circuit the cassette switch.
   2) Apply AC power to the unit, set it to the playback mode without a tape, and switch off the AC power just before the loading process is completed.
   3) Use the height gauge to check the amount of vertical tilt of the tension pole.
   4) If a large tilt is observed, correct it by using the tension arm bending tool to bend the tension arm. (Be careful not to bend the arm excessively.)

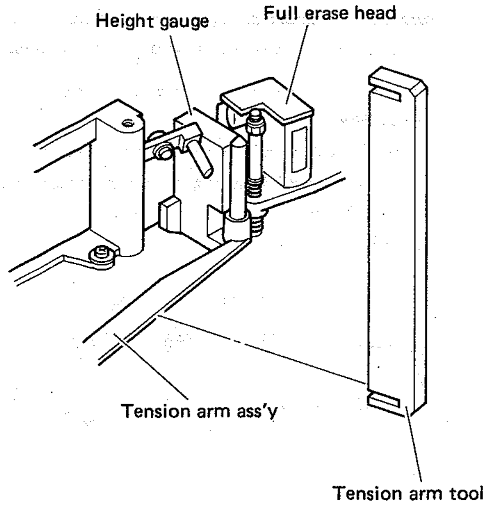


Fig. 4-21

   5) Apply AC power and set the unit to the playback mode.
   6) Check whether the tension arm is positioned in the center of the circular chassis hole.
   7) If necessary, loosen screw (C) and adjust the position of the tension band holder.

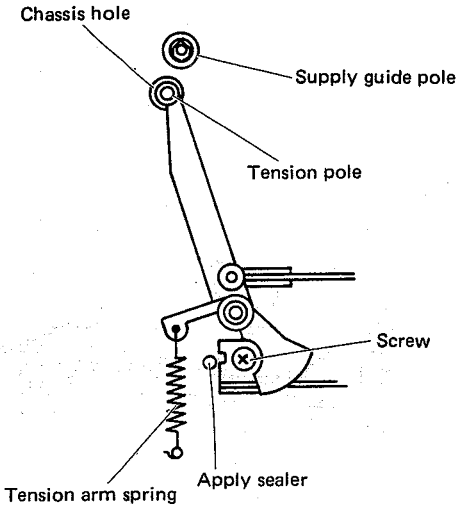


Fig. 4-22

   8) Insert the cassette torque meter and set the unit to the playback mode.
   9) Confirm that back tension on the supply side is 25 ± 5 g-cm.

   Note: The back tension is determined by the tension arm spring at the tension pole position. If necessary, first confirm that the tension pole is in the correct position, and then perform back tension check by employing the cassette torque meter in the playback mode. If largely off-standard readings are obtained, replace the tension arm spring and reconfirm the tension pole position.

4.5.8 Pinch roller

1. Remove screw (A) and remove the pinch roller assembly by pulling it off in the upward direction.
2. Replace the pinch roller assembly.

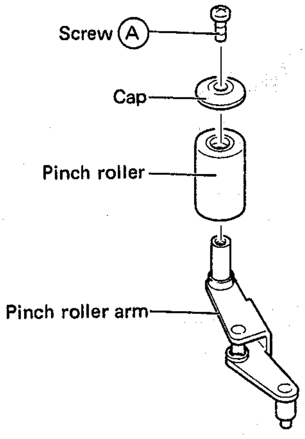


Fig. 4-23

Note: Be careful not to apply excessive force when tightening the pinch roller screw, to avoid lengthwise deformation of the pinch roller arm assembly.

3. Insert a cassette tape (to be used for own recordings) and confirm that tape travel at the beginning of the tape is stable and the tape does not touch the upper or lower guide edges.

5.9 Brake solenoid

1. Pull out the wire connector leading to the solenoid from the junction board.
2. Remove screws (A) and remove the record safety assembly.
3. Remove the E-washer (B) on top of the slide plate.
4. Remove screws (C) and remove the solenoid holder.
5. Remove screws (D) and remove the solenoid for replacement.
6. Reassemble by reversing the above steps. After completing the reassembly procedure, confirm that the solenoid smoothly operates the slide plate.

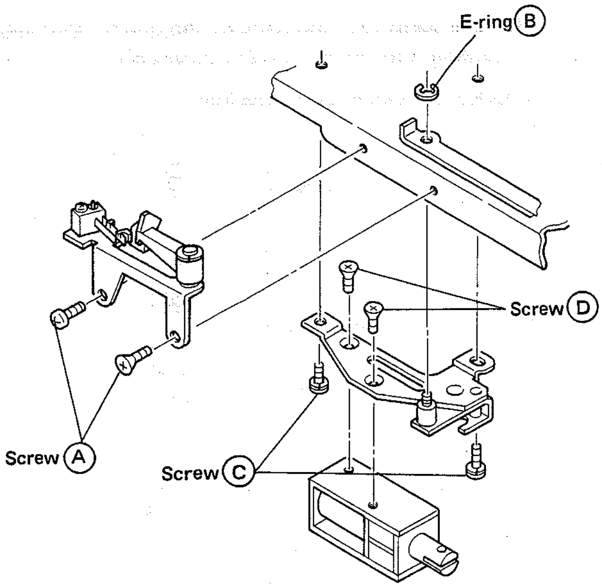


Fig. 4-24

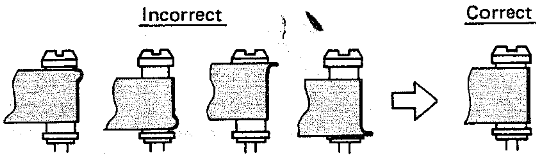
4.6 TAPE TRANSPORT SYSTEM CHECKS AND ADJUSTMENT

The tape transport system has been precisely aligned at the factory and normally does not require readjustment. The following steps are therefore necessary only in cases of severe usage or when replacing parts affecting the tape transport system.

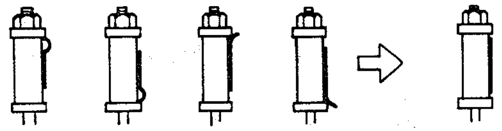
Note: To operate the set with the cassette housing removed, close or short the terminals of the cassette switch.

4.6.1 Tape transport check

1. Employ a cassette tape and check at tape beginning and ending portion according to the following steps.
2. Operate the machine between Play and Stop modes several times.
   During Loading and Unloading, observe the tape at the supply and take-up guide rollers and guide poles.
   Confirm absence of curling, wrinkling, etc. as shown in Fig. 4-25.



(a) Guide roller



(b) Guide pole

Fig. 4-25 Guide roller and guide pole

3. Observe the tape as it becomes wrapped around drum during loading and as it separates from the drum during unloading.

   Confirm absence of damage to the tape at points Ⓐ and Ⓑ as shown in Fig. 4-26 and absence of contact noise between head tips and tape edge.

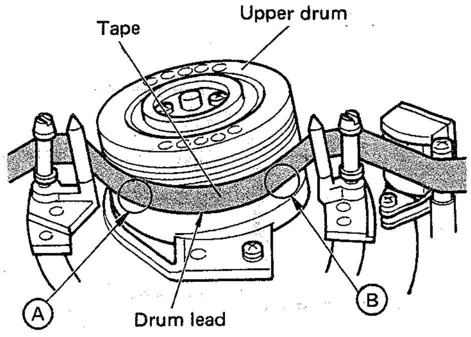


Fig. 4-26 Drum lead check

NOTES:

1. Slips upward : sound becomes produced by contact between tips of rotating heads and edge of tape.
2. Slips downward : tape curls or wrinkles from contacting lead face (sound may also be produced).

4. During Play mode, observe tape at the input and output portions (Ⓒ and Ⓓ in Fig. 4-27) of the head drum lead.
   Confirm that the tape slips neither upward nor downward with respect to the lead as shown in Fig. 4-27.

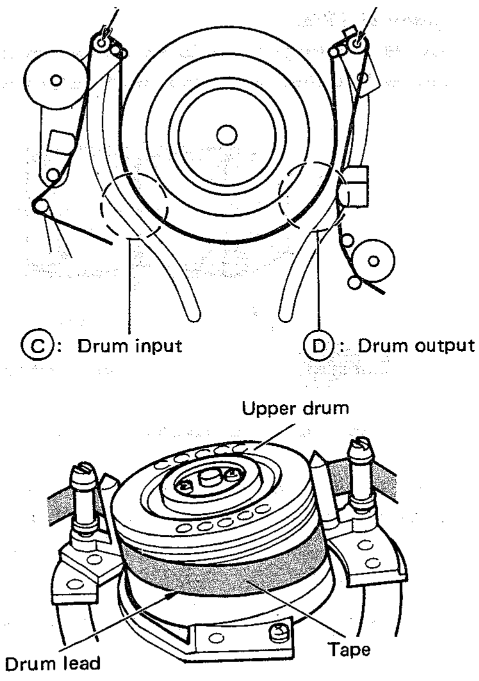


Fig. 4-27 Tape transport check

5. During Play mode, observe the tape at the take-up and supply guide poles and guide rollers.
   Confirm absence of curling, wrinkling, etc. as shown in Fig. 4-25.
6. If defects are noted the above checks, perform the following adjustments.

4.6.2 Tape transport adjustments

Perform only if defects are noted during tape transport check (4.6.1).

A: Guide roller height adjustment

1. Slightly loosen setscrews of the supply and take-up guide rollers as shown in Fig. 4-28.
2. Use a cassette tape and set for Play mode.
3. With a slotted screwdriver, slightly turn the supply guide roller (do not turn more than 180° at a time) and adjust so that at the drum input, the tape travels smoothly in the drum lead without slipping upwards or downwards.
4. Similarly, adjust the take-up guide roller for the drum output.

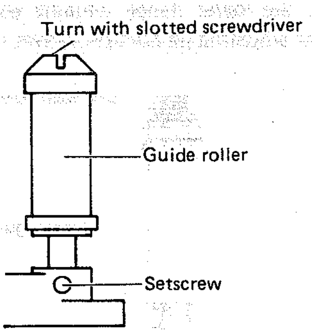


Fig. 4-28 Guide roller height adjustment

NOTES:

1. Loosen the setscrews only enough to allow the guide rollers to be turned.
   If excessively loose, tape motion may turn the rollers inadvertently.
2. Turn the rollers carefully to avoid damage to the tape.

B: Supply guide pole height adjustment

(a) Height check

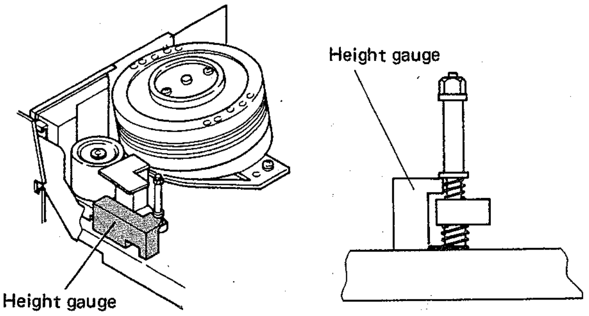


Fig. 4-29 Guide pole height check

1. Set the height gauge on the deck as shown in Fig. 4-29.
2. For guide pole, check the height of the lower face of the lower flange. If necessary, carefully adjust by turning the nut.
3. If guide pole height has been adjusted, follwing adjustments are required.

(b) Height adjustment

1. Use a cassette tape and set for Play mode.
2. Use a metric nutdriver to turn the supply guide pole to align the lower flange of the guide pole with the lower edge of the tape as shown by (b) of Fig. 4-25. Howerver, this adjustment must be performed so that at the same time, the lower flange remains within ±0.5 mm of the height adjusting jig portion shown in Fig. 4-29.

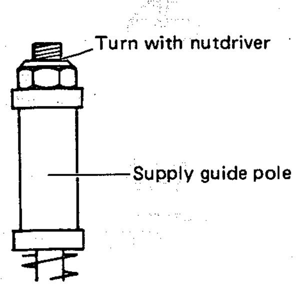


Fig. 4-30 supply guide pole height adjustment

3. If there is a large descrrepancy, check the tension pole and other mechanical components.

C: Audio/control head adjustment

1. Employ a cassette tape and set for Play mode.
2. Adjust audio/control head screw Ⓑ to align the lower edge of the tape with the lower flange of the tape guide for smooth transport.

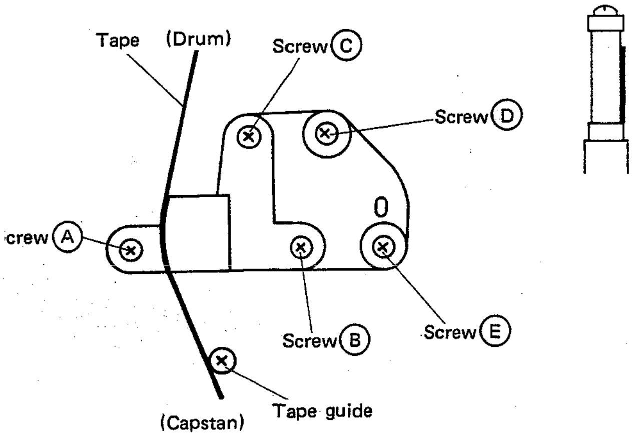


Fig. 4-31 A/C head

4.7 INTERCHANGEABILITY ADJUSTMENT

Before using alignment tape, employ a tape and confirm correct tape transport.

4.7.1 Preliminary checks

A: Check sequence 1

1. Connect oscilloscope to TP-6 of Y/C board. At this time, trigger the oscilloscope externally with the signal (30 Hz square wave) from TP-11 (DRUM F.F.) of Y/C board.
2. Play Stairstep portion of the alignment tape MH-C1.
3. Turn the Tracking control and adjust for maximum FM output at TP-6. Set the Tracking control to AUTO (center click position) and confirm that nearly maximum output is obtained.

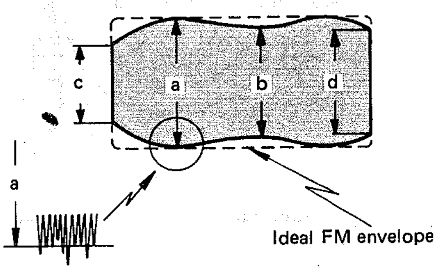


Fig. 4-32 FM waveform (max. output)

4. Refer to Fig. 4-32. Read the level of portion (a) of the waveform. If the waveform is serrated at point (a), read the value at the most uniform serrations as shown at left in Fig. 4-32.
5. Read the maximum FM level (a) and minimum FM level (b), and confirm that:

$$\frac{b}{a} \geqq 0.7 \text{ or } 20\log\frac{b}{a} \geqq -3\text{ dB}$$

6. Read the values at points (c) and (d) [drum input and output] and confirm that:

$$\frac{c}{a} \geqq 0.5 \text{ and} \frac{d}{a} \geqq 0.5 \ (\geqq -6\text{ dB})$$

NOTES:

1. Read minimum levels for (b), (c) and (d).
2. If above checks yield normal results, proceed to section 4.7.1 -B.
3. If defects are noted, perform adjustments of section 4.7.2.

B: Check sequence 2

1. Observe the FM waveform as in the previous section (4.7.1 -A) and turn the Tracking control.
   The waveform variation should be nearly parallel as shown in Fig. 4-33.

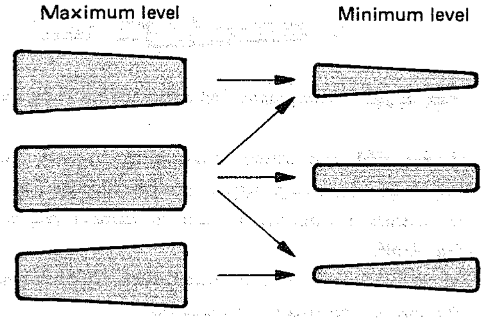


Fig. 4-33 Normal waveform examples

2. If the waveform varies as shown in Fig. 4-34, adjustment becomes required.

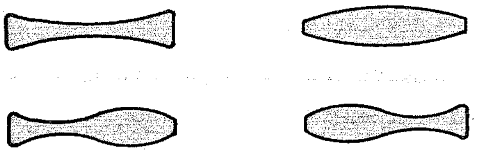


Fig. 4-34 Incorrect waveform examples

4.7.2 Preliminary adjustments

1. Loosen the setscrews of the supply guide roller and take-up guide roller.
   If the guide rollers turn freely, slightly tighten the setscrews.
2. Connect oscilloscope to TP-6 of Y/C board.
   Trigger the oscilloscope externally with the signal from TP-11 (DRUM F.F.) of Y/C board.
3. Play the alignment tape (stairstep signal) MH-C1.

A: Drum input

1. Observe oscilloscope display and adjust the Tracking control for maximum FM output.
2. Refer to Fig. 4-35. Examples of incorrect waveforms are shown by A.
   Use a slotted screwdriver to adjust the supply guide roller so that the rising portion (drum input portion) of the waveform becomes flat as shown by B.

   NOTES:
   1. If the guide roller turns freely, tighten the setscrew slightly.
   2. Be sure to adjust the guide roller only by small amounts at a time in order to avoid damaging the alignment tape.

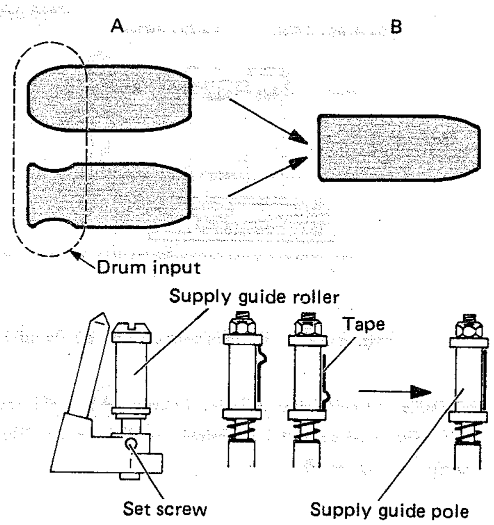


Fig. 4-35 Drum input adjustment

   In addition to observing the waveform, confirm absence of tape slippage or curling at the drum lead and guide poles.
3. At the supply guide pole, if the tape separates from the guide or wrinkling occurs, adjust the guide pole height.

B: Drum output

1. In the same manner as for the drum input, turn the take-up guide roller to adjust the falling portion (drum output portion) of the FM waveform.
   Incorrect examples are shown by C in Fig. 4-36, while D indicates the correct adjustment.
2. If the tape separates from the guide or wrinkling occurs at the tape guide, adjust by turning screw Ⓑ of the audio/control head as shown in Fig. 4-36.

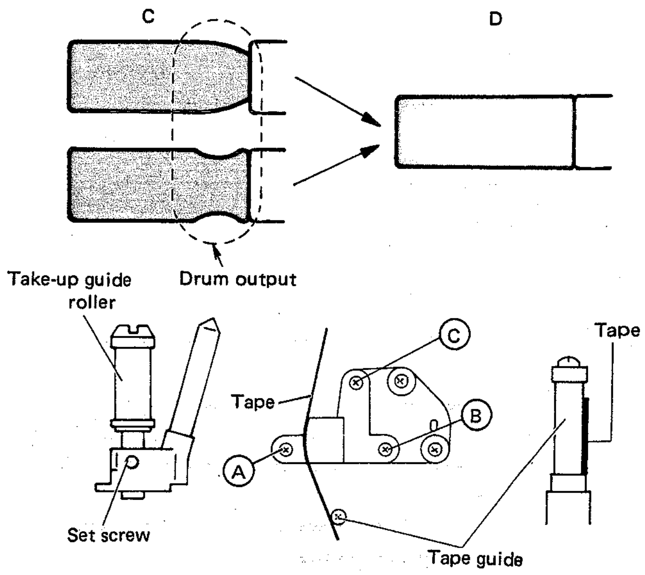


Fig. 4-36 Drum output adjustment

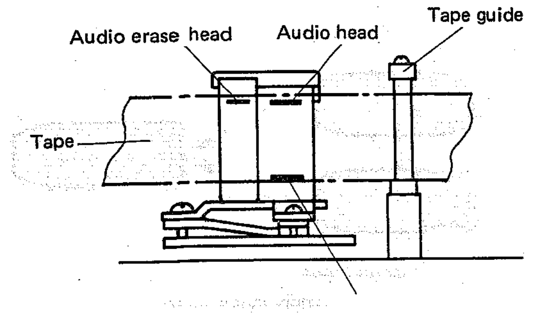


Fig. 4-37 Audio/control head height

3. Carefully and evenly adjust screws Ⓐ, Ⓑ and Ⓒ to align the audio/control head height with the tape as shown in Fig. 4-36.

NOTES:

1. Fine adjustment is not required at this time. It is sufficient that the tape is engaged with the guide pole and servo operates stably (control signal picked up).
2. If the tape separates from the tape guide or wrinkling occurs, screw Ⓑ (Fig. 4-36) has been turned excessively with respect to screws Ⓐ and Ⓒ, causing the audio/control head to incline forward or rearward. Use care to adjust screws Ⓐ, Ⓑ and Ⓒ evenly and observe that small wrinkles are not produced at the tape guide.

4.7.3 Interchangeability fine adjustment

1. Connect oscilloscope to TP-6 of Y/C board. Play stairstep segment of the alignment tape MH-C1. Observe the FM waveform and adjust the Tracking control for minimum FM output level.

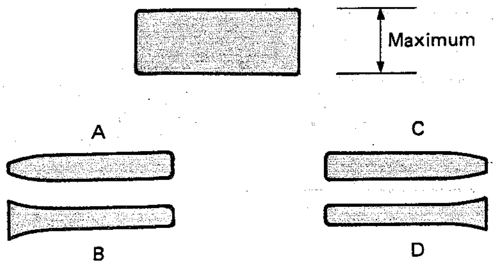


Fig. 4-38 Minimum FM output (incorrect examples)

2. If the waveform becomes as shown by A or B of Fig. 4-38, carefully adjust the supply guide roller height so that the waveform becomes as shown by E, F or G of Fig. 4-39. At this time, if the waveform fluctuates, adjust to the point of minimum fluctuation.

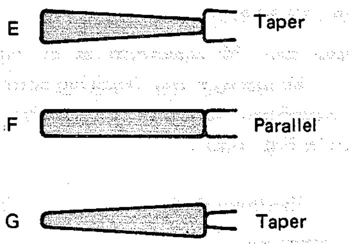


Fig. 4-39 Minimum FM output (correct examples)

3. If the FM waveform appears as shown by C or D in Fig. 4-38, carefully adjust the take-up guide roller height to obtain a waveform such as shown by E, F or G of Fig. 4-39. At this time, if the waveform fluctuates, adjust to the point minimum fluctuation.
4. Vary the Tracking control from maximum to minimum FM output. Perform fine adjustment of supply and take-up guide rollers so that waveform variation becomes as shown by E, F or G of Fig. 4-39.

4.7.4 Audio/Control head height, azimuth and inclination

See section 4.5.6 Audio/control head assembly.

4.7.5 Setscrew tightening

1. Check for maximum FM output waveform, maximum audio out and absence of tape wrinkling or other transport irregularities, then secure the guide rollers. Perform in Stop mode.
2. Since the guide rollers are easily moved, use care when securing.
3. After tightening the setscrews, again perform interchangeability final check.

4.7.6 Interchangeability final check

Confirm section 4.7.1 Preliminary checks.

4.7.7 Servo circuit adjustment (See section 5.4)

1. Video head switching position.
2. Tracking preset.

4.7.8 Control head phase adjustment

1. Connect oscilloscope to TP-6 of Y/C board. Trigger the oscilloscope externally with the signal from TP-11 (Drum F.F.) of Y/C board.
2. Play stairstep portion of the alignment tape MH-C1 and observe the oscilloscope display.
3. Set the Tracking control to AUTO (center click position).

4. Confirm that the level difference between this setting and the maximum level obtained manually is:

$$-20 \log \frac{b}{a} \leqq 1 \text{ dB or } \frac{b}{a} \geqq 0.9$$

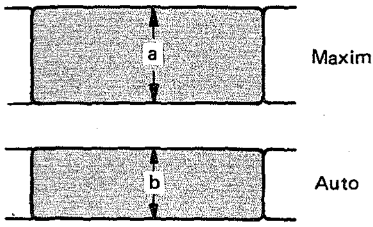


Fig. 4-40 FM output level

5. If necessary, adjust as follows.
6. Set the Tracking control to AUTO and play stairstep segment of the alignment tape MH-C1.
7. Loosen two screws Ⓓ and Ⓔ and slide the A/C head assembly fully in the direction of the tape guide.

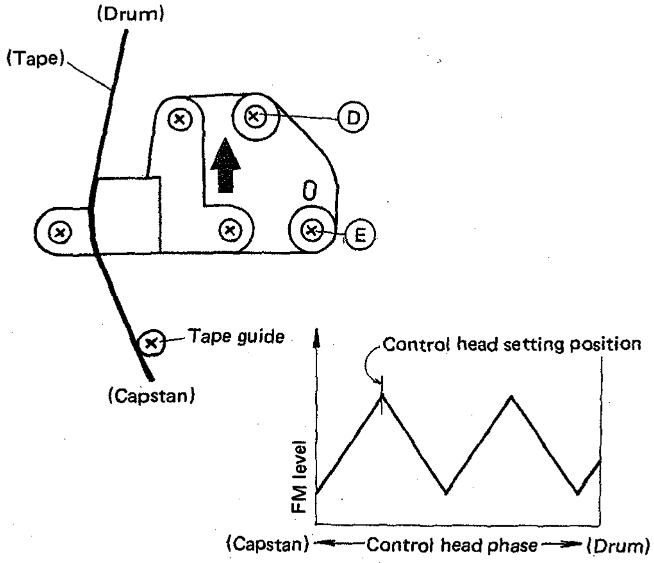

(Drum)
(Tape)
D
E
Tape guide
(Capstan)
Control head setting position
FM level
(Capstan) ← Control head phase → (Drum)

Fig. 4-41 Control head phase adjustment

8. Slightly tighten the two screws and play stairstep segment of the alignment tape MH-C1.
9. Set the audio/control head position tool (PUJ47351-2) over the screw Ⓔ and insert the pin of the tool into the hole at the side of the screw.
10. Slowly turn the tool and slide the A/C head assembly in the direction of the arrow as shown in Fig. 4-41.
11. Set the A/C head assembly to the position where first maximum FM level is obtained. Tighten two screws Ⓓ and Ⓔ.

4.7.9 Final checks (recording and playback)

1. Use a blank tape and perform recording and playback. Confirm FM waveform and specifications equivalent to those during playback of alignment tape (stairstep signal). See section 4.7.1.
2. Perform checks and adjustments of the audio recording and playback levels. See section 5.6 Audio circuit.
3. Check other signal systems by referring to section 5 electrical adjustment.

SECTION 5
ELECTRICAL ADJUSTMENTS

5.1 PREPARATION

Electrical adjustments are required after replacing circuit components and certain mechanical parts. It is important to perform these adjustments only after all repairs and replacements have been completed. Also, do not attempt these adjustments unless the proper equipment is available.

5.1.1 Required test equipment and jig

1. Color TV monitor
2. Oscilloscope: Wide band
3. Signal generator: Color bar, Stair-step
4. Frequency counter
5. Regulated DC power supply (5 A)
6. Audio generator
7. Alignment tape (MH-C1)
8. Digital voltmeter

5.1.2 JVC alignment tape contents

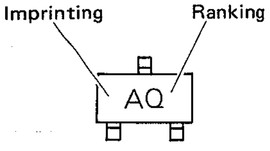
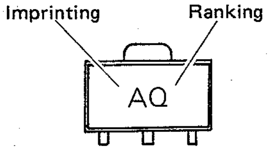
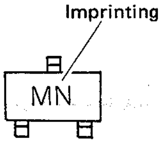
Segment	Playback Time	Video Signal	Audic Signal	Applications
1	3 minutes	(none)	(none)	
2	5 minutes	Stairstep	7 kHz	● Interchangeability checks and adjustments ● Servo circuit checks and adjustments ● Audio head azimuth adjustments
3	3 minutes	(none)	3 kHz	● Tape speed checks ● Wow and flutter checks
4	6 minutes	Color bar	1 kHz	● Video signal playback circuit checks and adjustments ● Audio signal playback circuit checks and adjustments
5	2 minutes	RF sweep	(none)	● Video head resonance adjustments Marker: 2 MHz, 4 MHz, 5 MHz

Table 5-1 MH-C1 contents

.1.3 Replacing subminiature "Chip" parts

Additional compactness is achieved by using subminiature chip parts for certain circuit elements. When replacing these parts, note the cautions outlined below.

Chip transistors and diodes used in this model are outlined as follows.

Transistors				Diodes	
Type	Imprinting	Type	Imprinting	Type	Imprinting
2SB709	A	2SB798	O	MA151WA	MN
2SB710	C	2SC2873	M	MA151WK	MT
2SC2716	F	2SD999	C		
2SD601	Y				
2SD602	W				
 (Standard type)		 (Power type)			

1. Required tools:
   1) Fine tipped, well insulated soldering "pencil", about 30 Watts.
   2) Tweezers
   3) Blower type hair dryer.
2. Soldering cautions:
   1) Do not apply heat for more than 3 seconds.
   2) Avoid using a rubbing stroke when soldering.
   3) Discard removed chips; do not reuse them.
   4) Supplementary cementing is not required.
   5) Use care not to scratch or otherwise damage the chips.
3. Removal (resistors, capacitors, etc.):
   1) Melt the solder at one side.

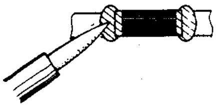


Fig. 5-1

   2) Grasp the part with tweezers and melt the solder at the other side.

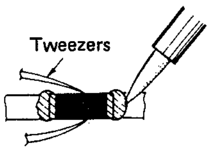


Fig. 5-2

   3) Remove the part with a twisting motion.

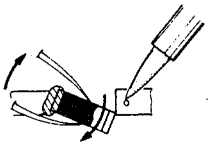


Fig. 5-3

4. Removal (transistors, diodes, etc.):
   1) Melt the solder of one lead.

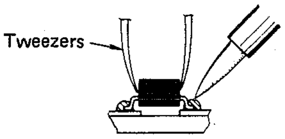


Fig. 5-4

   2) Lift the side of that lead upward.

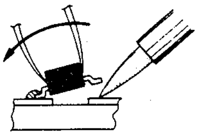


Fig. 5-5

3) Simultaneously heat the solder of the two remaining leads and lift part to remove.

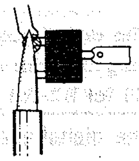


Fig. 5-6

5. Preheating (except for semiconductors):

Immediately before installing new resistors or capacitors, use a blower type hair dryer and preheat the part for about two minutes at approximately 150°C.

6. Replacement:

1) Presolder the contact points of the circuit pattern.

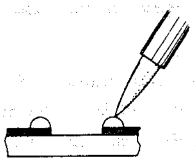


Fig. 5-7

2) Press the part downward with tweezers and apply the soldering pencil as indicated in the figure.

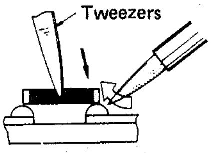


Fig. 5-8

5.1.4 Check and Adjustment steps

The check and adjustment steps are provided in the following in the form of charts. For clarity, the nomenclature used in the charts is outlined below.

No.	Checks and adjustments are numbered in the recommended sequence in which they are to be performed.
Item	Name assigned to the particular check and adjustment step.
Check Point	Location to which measuring instrument (oscilloscope unless otherwise noted) is to be connected.
Adjustment Parts	Variable component (resistor, capacitor, etc.) to be adjusted in this step. Dash (–) indicates check only.
Signal & Mode	● Input signal required to perform adjustment. Dash (–) indicates that special signal is not required. ● Equipment operating mode at time of check or adjustment.
Color bar	Color bar signal as video input
Stairstep	Stairstep signal as video input
1 kHz	Supply a 1 kHz sinewave as audio input signal.
MH-C1 Color bar	Play color bar segment of JVC MH-C1 alignment tape.
MH-C1 Stairstep	Play stairstep segment of JVC MH-C1 alignment tape.
MH-C1 1 kHz	Play 1 kHz audio signal segment of JVC MH-C1 alignment tape.
MH-C1 RF sweep	Play RF sweep segment of JVC MH-C1 alignment tape.
STOP	Power on and machine in Stop mode
REC	Recording mode
P.B.	Play mode
REC → (another mode)	Use blank tape, record, then play back in the mode specified.
SEARCH	Shuttle Search (S-FWD and S-REV) playback mode
Description and Waveform	This column provides an explanation of the step, notes, adjustment values and waveform diagrams.

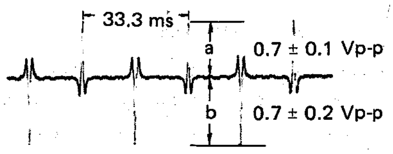
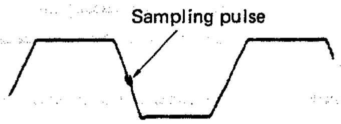
.2 SWITCHING REGULATOR CIRCUIT

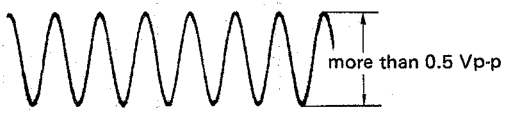
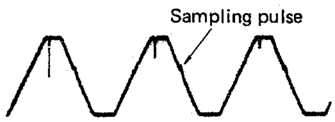
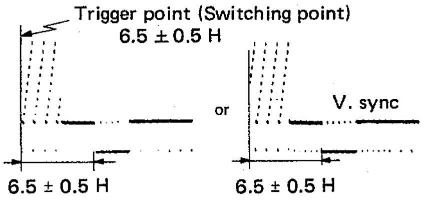
No.	Item	Check Point	Adjustment Parts	Signal & Mode	Description and Waveform
1	5 V DC Output Voltage	CN1 Pin 8 SW REG	VR2	STOP	1. Connect the digital voltmeter to CN1 pin 8 of the switching regulator board. 2. Adjust VR1 for 5 ± 0.1 V DC.
2	9 V DC Output Voltage	CN1 Pin 2 SW REG	VR1	STOP	1. Connect the digital voltmeter to CN1 pin 2 of the switching regulator board. 2. Adjust VR1 for 9.0 ± 0.15 V DC.

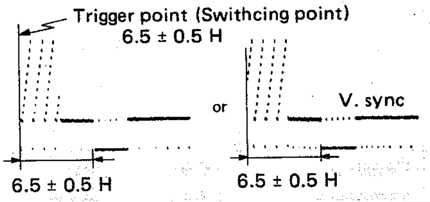
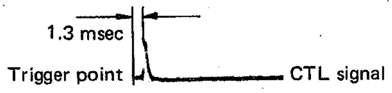
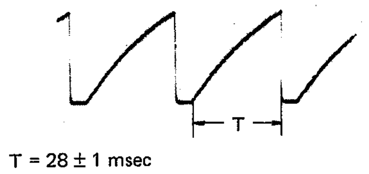
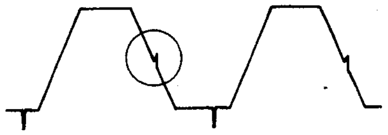
.3 MECHACON CIRCUIT

No.	Item	Check Point	Adjustment Parts	Signal & Mode	Description and Waveform
1	Battery Alarm	Battery LED	R24 Mechacon	STOP	1. Set the voltage of DC power supply for 11.0 V. 2. Adjust R24 to the point that Battery Alarm LED starts to light.
2	Battery Down Stop	Power LED	R32 Mechacon	STOP	1. Set the voltage of DC power supply for 10.3 V. 2. Adjust R32 to the point that the power turns off.
3	Reel Motor Voltage	TP-301 TP-8 Servo & MDA	R41 Mechacon	PLAY	1. Connect the digital voltmeter between TP-301 and TP-8 (GND) of the Servo & MDA board. 2. Adjust R41 for 3.0 ± 0.2 V DC.
4	Operation Check				Refer to Sec. 3.1.5 and 3.1.6.

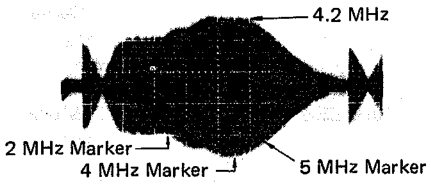
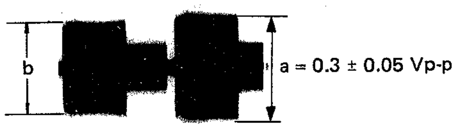
5.4 SERVO CIRCUIT

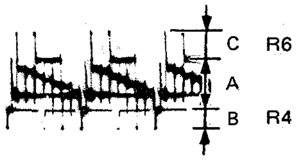
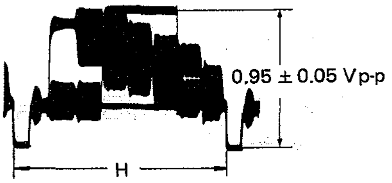
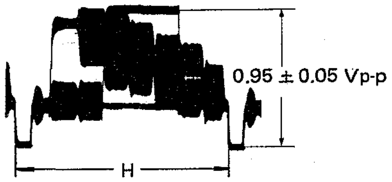
No.	Item	Check Point	Adjustment Parts	Signal & Mode	Description and Waveform
1	Drum Pulse Level	TP-4 Servo	R160 Servo	Color bar or TV signal REC	1. Connect oscilloscope to TP-4 of the Servo board. 2. Adjust R160 so that the positive level (a) becomes 0.7 ± 0.1 Vp-p. 3. Confirm that the negative level is 0.7 ± 0.2 Vp-p.  Note: Drum Servo must be locked.
2	Drum Sampling Position	TP-5, TP-7 Servo	R259 Servo	Color bar or TV signal REC	1. Connect oscilloscope to TP-5 of the Servo board. Trigger the oscilloscope externally (+ slope) with the signal from TP-3 of the Servo board. 2. Adjust R259 to where the sampling pulse is positioned at the center of the trapezoid and the voltage at TP-7 becomes 2.5 ± 0.1 V. 

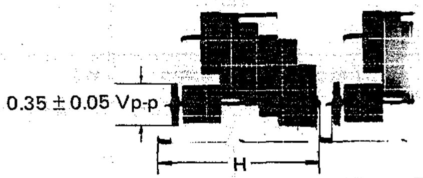
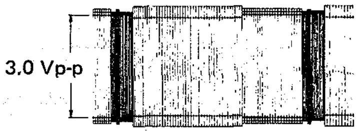
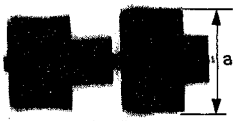
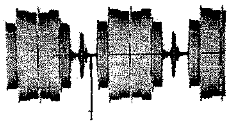
No.	Item	Check Point	Adjustment Parts	Signal & Mode	Description and Waveform
3	Capstan FG Level	TP-1 Servo		Color bar or TV signal REC	1. Connect oscilloscope to TP-1 of the Servo board. 2. Confirm that the voltage of TP-1 is more than 0.5 Vp-p and the frequency is 360 Hz. 3. Confirm that the capstan FG level fluctuation between a and b becomes less than 1.41.  b (Max. level)/a (Min. level) ≦ 1.41
4	Capstan Sampling Position	TP-6 TP-12 Servo	R5 Servo	Color bar or TV signal REC	1. Connect oscilloscope to TP-6 of the Servo board. Trigger the oscilloscope externally (+ slope) with the signal from TP-3 of the Servo board. 3. Adjust R5 to where the sampling pulse is positioned at the center of the trapezoid and the voltage at TP-12 becomes 2.5 ± 0.1 V. 
5	P.B. Switching Point	TP-10 Y/C	R23 (CH-1) Servo R26 (CH-2) Servo	MH-C1 Stairstep P.B. (+) Trigger (–) Trigger	1. Connect oscilloscope to video out or TP-10 of the Y/C board. 2. Trigger the oscilloscope externally (+ slope) with the signal from TP-3 of the Servo board. 3. Adjust R23 to the position that the trigger point is 6.5 ± 0.5 H from V. sync. 4. Trigger the oscilloscope externally (– slope) with the signal from TP-3 of the Servo board. 5. Adjust R26 to the position that the trigger point is 6.5 ± 0.5 H from V. sync.  Trigger point (Switching point) 6.5 ± 0.5 H or V. sync 6.5 ± 0.5 H 6.5 ± 0.5 H

No.	Item	Check Point	Adjustment Parts	Signal & Mode	Description and Waveform
6	Rec. Switching Point	TP-10 Y/C	R36 Servo	Color bar REC (+) Trigger	1. Supply a color bar signal to video in. Trigger the oscilloscope externally (+ slope) with the signal from TP-3 of the Servo board. 2. Connect oscilloscope to TP-10 of the Y/C board. 3. Adjust R36 to the position that the trigger point is 6.5 ± 0.5 H from V. sync.  Trigger point (Swithcing point) 6.5 ± 0.5 H or V. sync 6.5 ± 0.5 H 6.5 ± 0.5 H
7	Tracking Center	TP-2 Servo	R45 Servo	MH-C1 Stairstep P.B. Set tracking control to the center click position.	1. Trigger the oscilloscope externally (– slope) with the signal from TP-3 of the Servo board. 2. Connect the oscilloscope to TP-2 of the Servo board. 3. Adjust R45 to the position that the trigger point is 1.3 msec from the positive CTL pulse. 
8	CTL DUTY MM	TP-11 Servo	R39 Servo	MH-C1 Stairstep Search F.F. Tracking VR center	1. Connect the oscilloscope to TP-11 of the Servo board. 2. Adjust R39 to obtain a pulse width of 28 ± 1 m-sec as shown in the figure. 
9	Search Speed	TP-6 TP-12 Servo	R3 R58 Servo	MH-C1 Stairstep Search F.F. Tracking VR center	1. Connect the oscilloscope to TP-6 of the Servo board. 2. Adjust R3 to where the sampling pulse is positioned at the center of the trapezoid and the voltage at TP-12 becomes 2.5 ± 0.1 V. 3. Confirm that the sampling pulse is positioned at the center of the trapezoid during search rewind. 4. Adjust R58 to minimize the noise bar on the TV screen. 
10	Capstan Brake	TP-14 Servo	R137 Servo	STOP	1. Connect a digital voltmeter to TP-14 of the Servo board. 2. Adjust R137 for 2.5 ± 0.1 VDC.

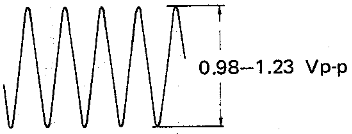
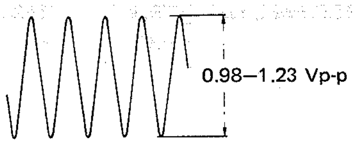
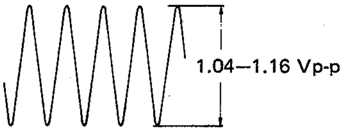
5.5 VIDEO CIRCUIT

No.	Item	Check Point	Adjustment Parts	Signal & Mode	Description and Waveform
1	Video Head Resonance and Q	TP-6	CH-1 R9, C7 PRE CH-2 R8, C8 PRE	MH-C1 RF sweep P.B.	Note: The MH-C1 marker appears at 2 MHz, 4 MHz, and 5 MHz, however, adjust for 4.2 MHz. 1. Trigger the oscilloscope externally with the signal from TP-11 of the Y/C board. 2. Use (–) Trigger for CH-1 and (+) for CH-2. 3. Turn R9 (CH-1 Q) fully counterclockwise and R8 (CH-2 Q) fully clockwise. 4. Adjust C7 to set the CH-1 resonance point to 4.2 MHz and C8 to set the CH-2 resonance point to 4.2 MHz. 5. If the levels of CH-1 and CH-2 differ, adjust the higher level channel to match the lower by R9 and R8. 6. Record a video signal, then play back. Confirm absence of flicker and black-white reversal in the reproduced picture. If necessary, carefully readjust R9 and R8. 
2	P.B. Color Level	TP-34 Y/C	R47 Y/C	MH-C1 Color bar P.B.	1. Connect oscilloscope to TP-34 of the Y/C board. 2. Trigger the oscilloscope externally with the signal from TP-11 of the Y/C board. 3. Adjust R47 for a waveform level of 0.3 ± 0.05 Vp-p. 4. If the levels of CH-1 and CH-2 differ, adjust the higher level channel for 0.3 Vp-p. 
3	P.B. 3.58 MHz	TP-36 Y/C	R66 Y/C	MH-C1 Color bar P.B.	1. Connect a frequency counter to TP-36 of the Y/C board. 2. Adjust R66 to obtain 3579545 ± 10 Hz.
4	AFC 629 kHz	TP-33 Y/C	R56 Y/C	Color bar or TV signal REC	1. Supply a color input. 2. Connect a 680 Ω resistor between TP-41 and TP-42 of the Y/C board. 3. Connect a frequency counter to TP-33 of the Y/C board. 4. Adjust R56 to obtain 629 ± 4 kHz.

No.	Item	Check Point	Adjustment Parts	Signal & Mode	Description and Waveform
5	Carrier and Deviation (These adjustments are generally unnecessary except when replacing IC2 or IC6.)	TP-4 IC2, Pin 13 Y/C	R7, R37 R7 (Carrier) Y/C R37 (Deviation) Y/C	Color bar REC	1. Supply a color input signal. 2. Connect oscilloscope to IC2 pin 13 and precisely measure the DC potential of the sync tip. Make a note of this as voltage "A". 3. Connect a DC power supply between IC2 pin 13 and ground. 4. Without an input signal, set for the Record mode and precisely apply sync tip bias "A" as observed with the oscilloscope. 5. Connect a frequency counter to TP-4 of the Y/C board. 6. Adjust R7 to obtain 3.4 ± 0.05 MHz. 7. Carefully adjust the DC power supply to obtain 4.4 MHz ± 50 kHz at TP-4. 8. Precisely read the voltage of IC2 pin 13 with the oscilloscope. Make a note of this as voltage "B". 9. Disconnect the DC power supply. 10. Supply a color input signal. 11. Adjust R37 so that the Peak White at IC2 pin 13 becomes equal to voltage "B".
6	White and Dark Clip	TP-2 Y/C	R6 (White Clip) Y/C R4 (Dark Clip)	Color bar REC	1. Supply a color input signal. 2. Connect an oscilloscope to TP-2 of the Y/C board. 3. As shown in the figure, adjust R6 (White Clip) and R4 (Dark Clip).  A : B : C = 4 : (3.2 ± 0.2) : (1.6 ± 0.2)
7	E-E Y Level	VIDEO OUT	R32 Y/C	Color bar REC	1. Supply a color input signal. 2. With load at 75 Ω, connect an oscilloscope to VIDEO OUT. 3. Adjust R32 of the Y/C board for 0.95 ± 0.05 Vp-p. 
8	P.B. Y Level	VIDEO OUT	R25 Y/C	MH-C1 Color bar P.B.	1. When load at 75 Ω and connect an oscilloscope to VIDEO OUT. 2. Play JVC alignment tape (MH-C1) color bar signal. 3. Adjust R25 of the Y/C board for 0.95 ± 0.05 Vp-p. 

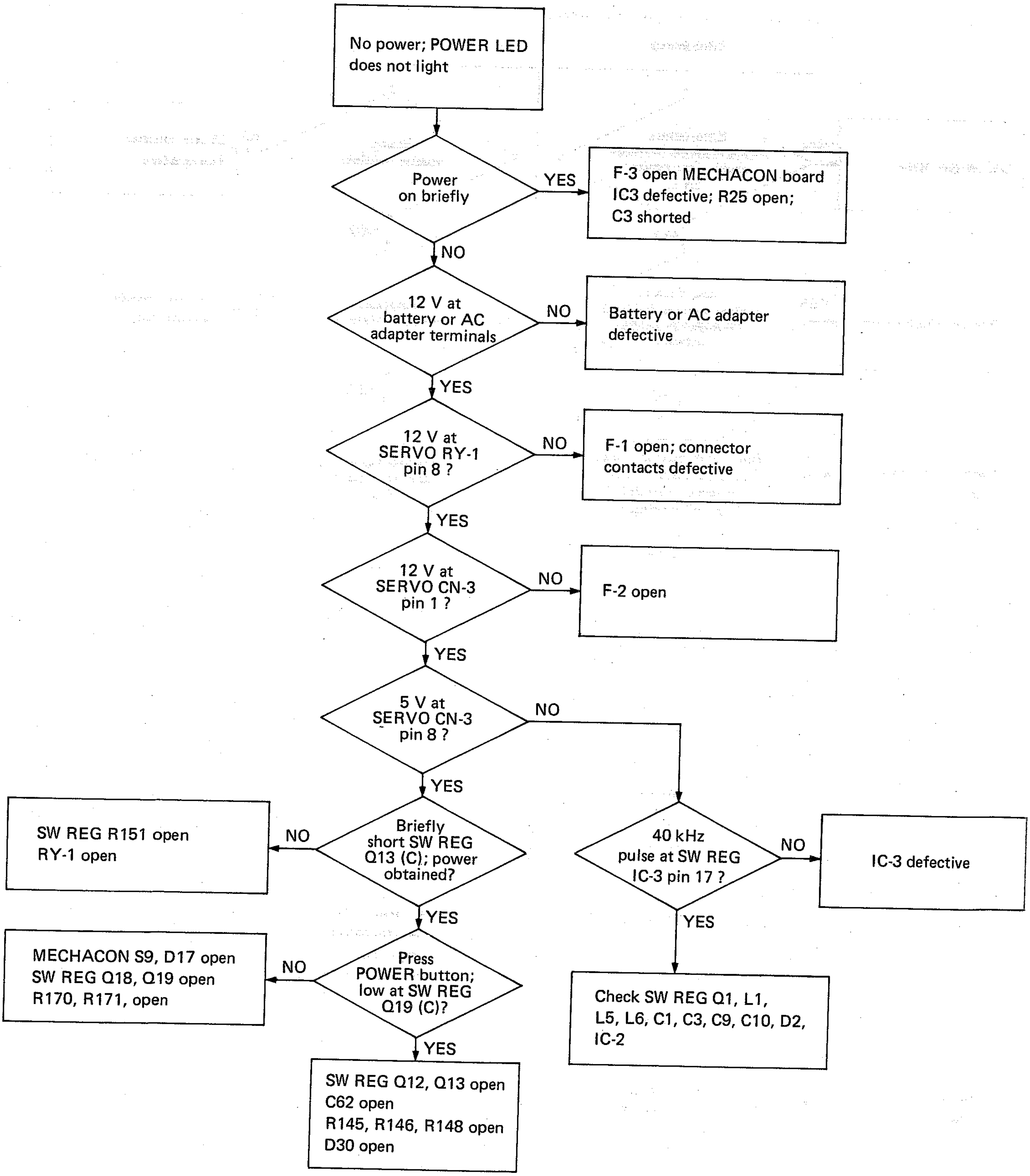
No.	Item	Check Point	Adjustment Parts	Signal & Mode	Description and Waveform
9	P.B. Burst Level	VIDEO OUT	R45 Y/C	MH-C1 Color bar P.B.	1. With load at 75 Ω and connect an oscilloscope to VIDEO OUT. 2. Play JVC alignment tape (MH-C1) color bar signal. 3. Adjust R45 of the Y/C board for a burst level of 0.35 ± 0.05 Vp-p. 
10	REC FM Level	TP-4 Y/C	R13 Y/C	Color bar REC	1. Supply a color input signal. 2. Connect an oscilloscope to TP-4 of the Y/C board. 3. Adjust R13 (REC FM Level) to obtain 3.0 Vp-p. 
11	REC Color Level	TP-34 Y/C	R40 Y/C	Color bar REC ↓ P.B.	1. Play JVC alignment tape (MH-C1) color bar, then check the P.B. color level of TP-34. 2. Supply color bar input signal, record then play back. 3. During recording, adjust R40 so that the color output level becomes the same as the level of step 1 during playback. 
12	Converter Balance	TP-48 Y/C	R57 Y/C	Color bar REC ↓ P.B.	1. Supply a color bar signal, record and then play back. 2. Connect an oscilloscope to TP-48 of the Y/C board. 3. Trigger the oscilloscope externally with the signal from TP-11 of the Y/C board. 4. Adjust R57 of the Y/C board for minimum leakage of the 4.2 MHz component. 

.6 AUDIO CIRCUIT

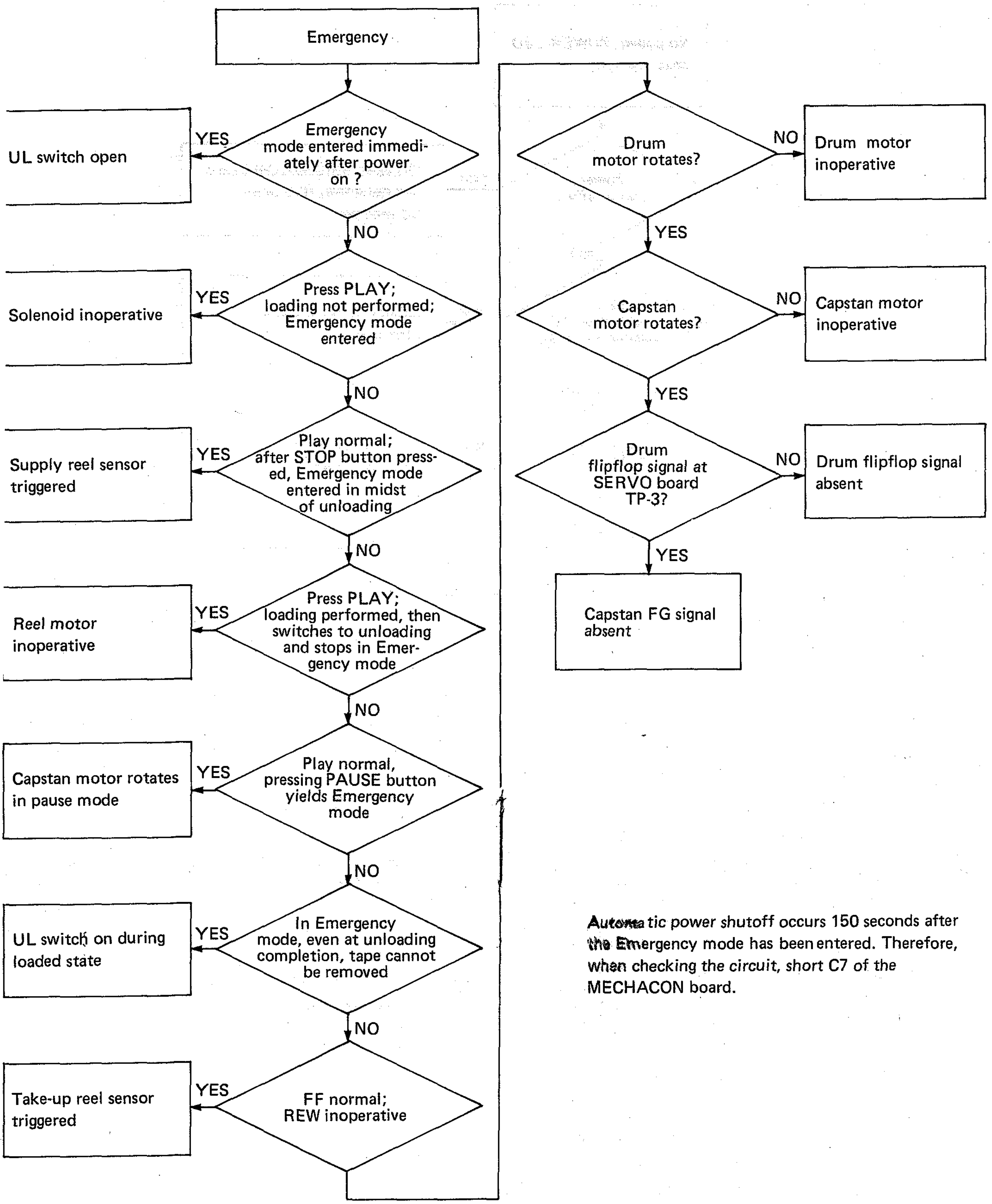
No.	Item	Check Point	Adjustment Parts	Signal & Mode	Description and Waveform
1	P.B. Level	Audio Line Out	R15 AUDIO	MH-C1 1 kHz P.B.	1. Adjust R15 for –6 ± 1 dBs (0.98–1.23 Vp-p) at audio output. 
2	E-E Level	Audio Line Out	R1 AUDIO	1 kHz –20 dB REC	1. Supply a 1 kHz –20 dB audio input signal to Camera Audio In. 2. Adjust R1 for –6 ± 1 dBs (0.98–1.23 Vp-p) at audio output. 
3	Audio Bias Level	TP-16 TP-13 Audio	R21 AUDIO	REC	1. Connect a digital voltmeter between TP-13 and TP-16 (GND) of the Audio board. 2. Adjust R21 to set the bias level for 3.0 mVrms.
4	Audio Rec. Level	TP-15 Audio	R4 AUDIO	1 kHz –20 dB REC ↓ P.B.	1. Supply video input signal and audio input signal of 1 kHz –20 dB and record then play back. 2. During recording adjust R4 so that the audio output level during playback becomes –6 ± 1 dBs (0.98–1.23 Vp-p). 
5	Noise Cancel	Audio Line Out	R28 AUDIO	P.B.	1. Cover the end sensor with opaque material and lower the cassette housing without cassette. 2. Set for the play mode and adjust R28 for minimum output level.

5.7 MECHACON TROUBLESHOOTING

No Power Flowchart


No power; POWER LED does not light
Power on briefly
YES
F-3 open MECHACON board IC3 defective; R25 open; C3 shorted
NO
12 V at battery or AC adapter terminals
NO
Battery or AC adapter defective
YES
12 V at SERVO RY-1 pin 8 ?
NO
F-1 open; connector contacts defective
YES
12 V at SERVO CN-3 pin 1 ?
NO
F-2 open
YES
5 V at SERVO CN-3 pin 8 ?
NO
YES
Briefly short SW REG Q13 (C); power obtained?
NO
SW REG R151 open RY-1 open
YES
Press POWER button; low at SW REG Q19 (C)?
NO
MECHACON S9, D17 open SW REG Q18, Q19 open R170, R171, open
YES
SW REG Q12, Q13 open C62 open R145, R146, R148 open D30 open
40 kHz pulse at SW REG IC-3 pin 17 ?
NO
IC-3 defective
YES
Check SW REG Q1, L1, L5, L6, C1, C3, C9, C10, D2, IC-2

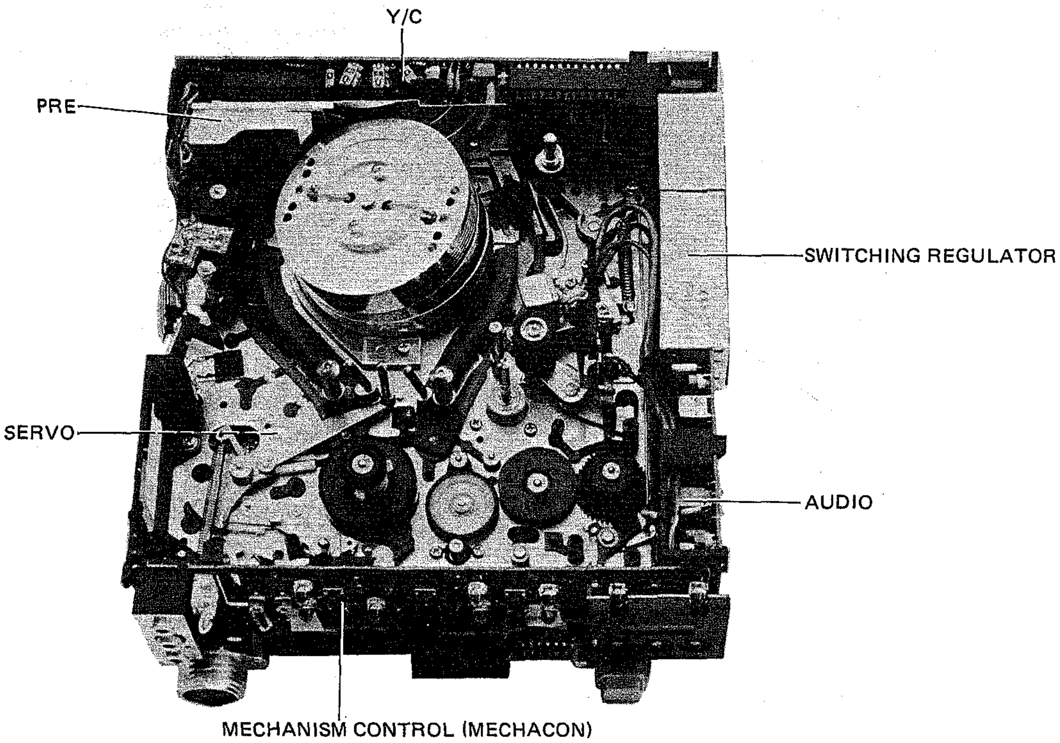
mergency Mode Flowchart


Emergency
Emergency mode entered immediately after power on ?
YES
UL switch open
NO
Press PLAY; loading not performed; Emergency mode entered
YES
Solenoid inoperative
NO
Play normal; after STOP button pressed, Emergency mode entered in midst of unloading
YES
Supply reel sensor triggered
NO
Press PLAY; loading performed, then switches to unloading and stops in Emergency mode
YES
Reel motor inoperative
NO
Play normal, pressing PAUSE button yields Emergency mode
YES
Capstan motor rotates in pause mode
NO
In Emergency mode, even at unloading completion, tape cannot be removed
YES
UL switch on during loaded state
NO
FF normal; REW inoperative
YES
Take-up reel sensor triggered
Drum motor rotates?
NO
Drum motor inoperative
YES
Capstan motor rotates?
NO
Capstan motor inoperative
YES
Drum flipflop signal at SERVO board TP-3?
NO
Drum flipflop signal absent
YES
Capstan FG signal absent

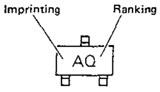
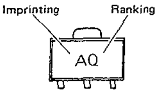
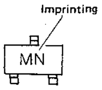
Automatic power shutoff occurs 150 seconds after the Emergency mode has been entered. Therefore, when checking the circuit, short C7 of the MECHACON board.

SECTION 6
CHARTS AND DIAGRAMS

6.1 CIRCUIT BOARD LOCATIONS


Y/C
PRE
SWITCHING REGULATOR
SERVO
AUDIO
MECHANISM CONTROL (MECHACON)

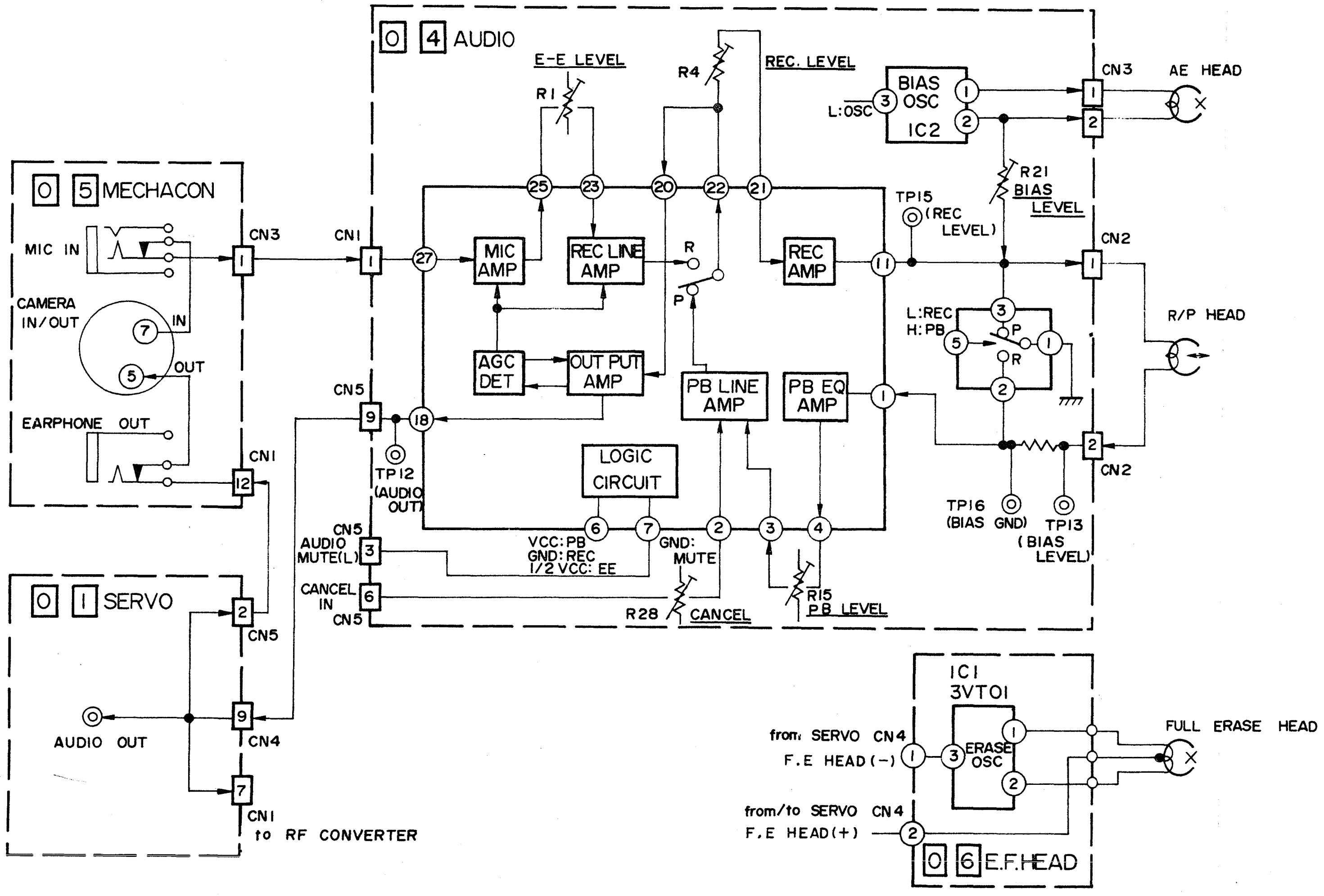
NOTE: Chip transistors and diodes used in this model are outlined as follows.

Transistors				Diodes	
Type	Imprinting	Type	Imprinting	Type	Imprinting
2SB709 2SB710 2SC2716 2SD601 2SD602	A C F Y W	2SB798 2SC2873 2SD999	O M C	MA151WA MA151WK	MN MT
 Imprinting Ranking AQ (Standard type)		 Imprinting Ranking AQ (Power type)		 Imprinting MN	

6.2 KEY TO ABBREVIATIONS

A	AC	Alternating Current
	ACC	Automatic Color Control
	A/CTL	Audio/Control
	A. DUB	Audio Dubbing
	AE	Audio Erase
	AFC	Automatic Frequency Control
	AGC	Automatic Gain Control
	AL	After Loading
	AMP	Amplifier
	ANT	Antenna
	APC	Automatic Phase Control
	AUX	Auxiliary
B	B	Base
	BAL	Balance
	BLK	Black
	BLU	Blue
	BPF	Band-Pass Filter
	BRN	Brown
	B. SOL	Brake Solenoid
	B/W	Black and White
C	CAP	Capstan
	CARR	Carrier
	CASS	Cassette
	CD	Count Down
	CF	Ceramic Filter
	CH	Channel
	COL	Color (Colour)
	COMP	Comparator
	CONN	Connector
	CONV	Converter
	COUNT SEA	Counter Search
	C. PAUSE	Camera Pause
	C. SW	Cassette Switch
	CTL	Control
D	DAC	Digital to Analog Converter
	DEMOD	Demodulator
	DET	Detector
	DL	Delay Line
	DOC	Drop Out Compensator
	D. PU	Drum Pick-up
	DRUM FF	Drum Flip-Flop
E	EF	Emitter Follower
	EMPH	Emphasis
	EQ	Equalizer
	E. SENS	End Sensor
	E. SW	Electronic Switch
	EP	Extended Play
F	F	Fuse
	F. ADV	Frame Advance
	FE	Full Erase
	FF	Fast Forward Flip-Flop
	FG	Frequency Generator
	FM	Frequency Modulation
	FR	Full Recording
	FWD	Forward
G	GEN	Generator
	GND	Ground
	GRN	Green
	GRY	Gray
H	HG	Hall Generator
	HPF	High-Pass Filter
I	ID	Identification
	IF	Intermediate Frequency
	IND	Indicator
	INV	Inverter
J	–	–
K	–	–
L	LP	Long Play
	LED	Light Emitting Diode
	LOAD	Loading
	LPF	Low-Pass Filter
M	M.	Motor
	MDA	Motor Drive Amplifier
	MECHACON	Mechanism Control
	MIC	Microphone
	MIX	Mixer, Mixing
	MMV	Monostable Multivibrator
	MOD	Modulator
	MUTE	Muting
N	NC	Non Connection
	NON-LIN	Non-Linear
O	OP	Operation
	ORN	Orange
	OSC	Oscillator
P	PB	Playback
	PI	Photo Interrupter
	PR	Pinch Roller
	P/S	Pause/Still
	P. TR	Power Transistor
	PU	Pick-up
	PWB	Printed Wiring Board
Q	–	–
R	REC	Recording (Record)
	RED	Red
	REG	Regulator
	REV	Reverse
	REW	Rewind
	RF	Radio Frequency
	R/P	Record/Playback
	RT	Rotary Transformer
	RUN IND	Running Indicator
	RY	Relay
S	SAFE	Safety
	SEAR	Search
	SEC	Second
	SEL	Select
	SENS	Sensor
	SF	Source Follower
	SOL	Solenoid
	S. R	Supply Reel
	S. SENS	Start Sensor
	S. SEP	Sync Separator
	SWD	Switched
	SW	Switch
	SP	Standard Play
T	T. E ALM	Tape End Alarm
	TP	Test Point
	TR	Transistor
	TRANS	Transformer
	T. REC	Timer Record
	T. SW	Timer Switch
	T/T	Tuner/Timer
	TU	Take-up
	TU. R	Take-up Reel
U	UL	Unloading
	UNSWD	Unswitched
V	VCO	Voltage Controlled Oscillator
	VLT	Violet
	V. PULSE	Vertical Pulse
	V. SEL	Video Select
	V/T	Video/Television
	V/U	VHF/UHF
	VXO	Variable Crystal Oscillator
W	W	Watt
	W/D	White and Dark
	WHT	White
Y	Y	Luminance
	YLW	Yellow
Z	–	–

6-3 AUDIO BLOCK DIAGRAM

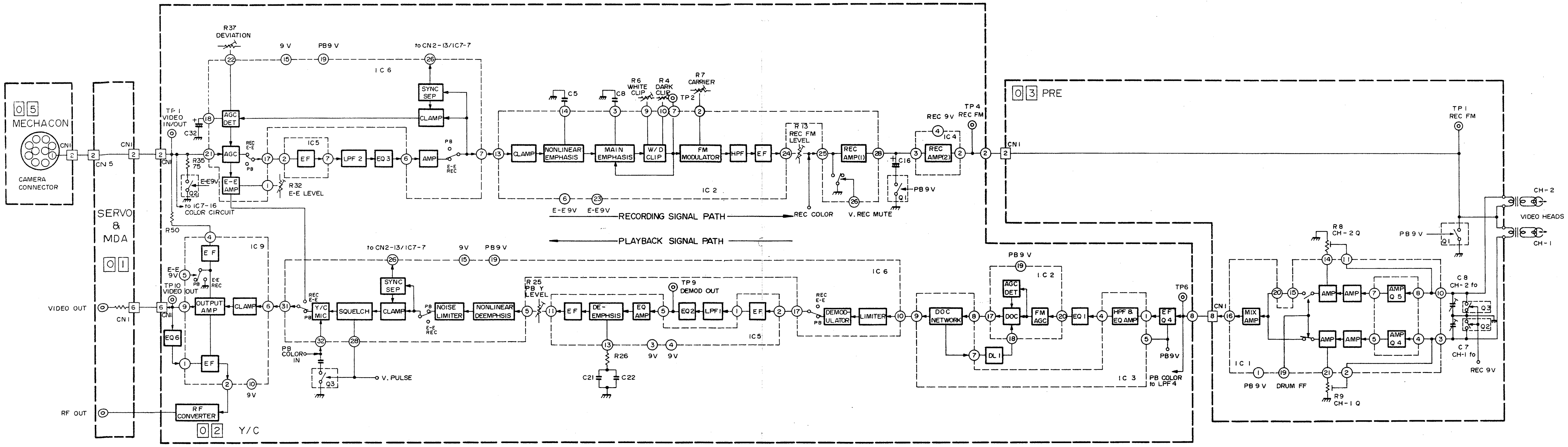


0 4 AUDIO
E-E LEVEL
R1
R4
REC. LEVEL
BIAS OSC
IC2
L:OSC
CN3
AE HEAD
R21
BIAS LEVEL
TP15
(REC LEVEL)
MIC AMP
REC LINE AMP
REC AMP
AGC DET
OUT PUT AMP
PB LINE AMP
PB EQ AMP
LOGIC CIRCUIT
R
P
CN2
R/P HEAD
L:REC
H:PB
TP16 (BIAS GND)
TP13 (BIAS LEVEL)
TP12 (AUDIO OUT)
CN1
CN5
AUDIO MUTE(L)
CANCEL IN
VCC:PB
GND:REC
1/2 VCC: EE
GND: MUTE
R28
CANCEL
R15
PB LEVEL
0 5 MECHACON
MIC IN
CAMERA IN/OUT
IN
OUT
EARPHONE OUT
CN3
CN1
0 1 SERVO
CN5
AUDIO OUT
CN4
CN1
to RF CONVERTER
IC1
3VT01
ERASE OSC
FULL ERASE HEAD
from SERVO CN4
F.E HEAD (−)
from/to SERVO CN4
F.E HEAD (+)
0 6 E.F.HEAD

A B C D E F G H

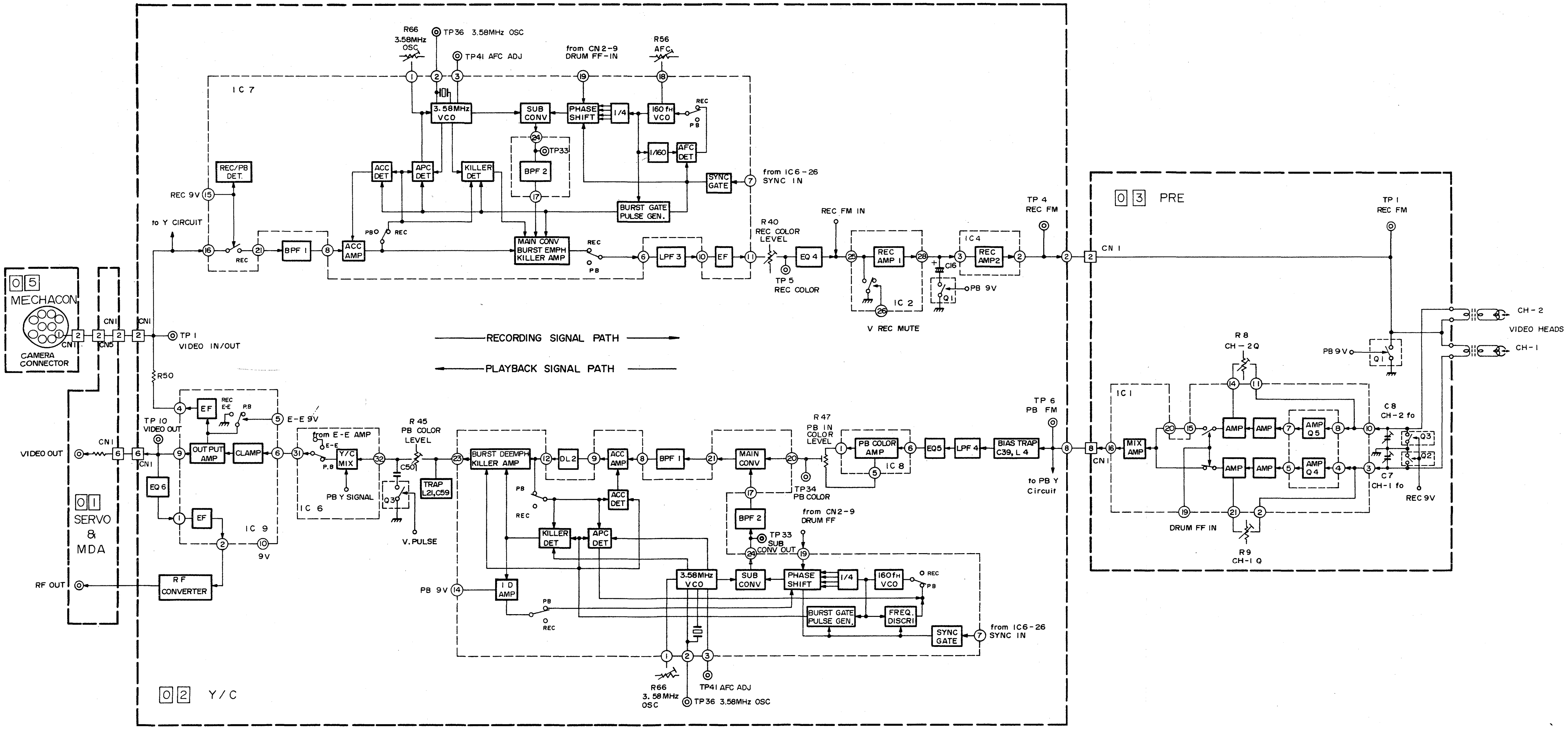
6.4 VIDEO BLOCK DIAGRAM

6.4.1 Luminance signal system


05 MECHACON
CAMERA CONNECTOR
CN1
CN 5
SERVO & MDA
01
TP 1 VIDEO IN/OUT
C32
R35 75
E-E9V
Q2
to IC7-16 COLOR CIRCUIT
R50
R37 DEVIATION
9 V
PB9 V
to CN2-13/IC7-7
IC 6
AGC DET
AGC
REC E-E
PB
E-E AMP
R32 E-E LEVEL
IC5
EF
LPF 2
EQ 3
AMP
SYNC SEP
CLAMP
E-E REC
C5
C8
R6 WHITE CLIP
R4 DARK CLIP
TP 2
R7 CARRIER
NONLINEAR EMPHASIS
MAIN EMPHASIS
W/D CLIP
FM MODULATOR
HPF
IC 2
E-E9V
E-E9V
R 13 REC FM LEVEL
REC AMP(1)
C16
Q1
PB9V
REC COLOR
V.REC MUTE
REC 9V
IC 4
REC AMP(2)
TP 4 REC FM
RECORDING SIGNAL PATH
PLAYBACK SIGNAL PATH
IC 9
E-E 9V
TP10 VIDEO OUT
E-E REC
VIDEO OUT
CN1
OUTPUT AMP
EQ6
RF OUT
RF CONVERTER
02 Y/C
Y/C MIC
SQUELCH
PB COLOR IN
Q3
V. PULSE
NOISE LIMITER
NONLINEAR DEEMPHSIS
R 25 PB Y LEVEL
DE-EMPHSIS
EQ AMP
TP9 DEMOD OUT
EQ2
LPF1
R26
C21
C22
DEMODULATOR
LIMITER
DOC NETWORK
DL 1
DOC
FM AGC
IC 3
EQ 1
HPF & EQ AMP
EF Q 4
TP6
PB COLOR to LPF 4
03 PRE
TP 1 REC FM
MIX AMP
IC 1
DRUM FF
R8 CH-2 Q
R9 CH-1 Q
AMP Q 5
AMP Q 4
C 8 CH-2 fo
C 7 CH-1 fo
REC 9V
CH-2
CH-1
VIDEO HEADS

1 2 3 4 5 6

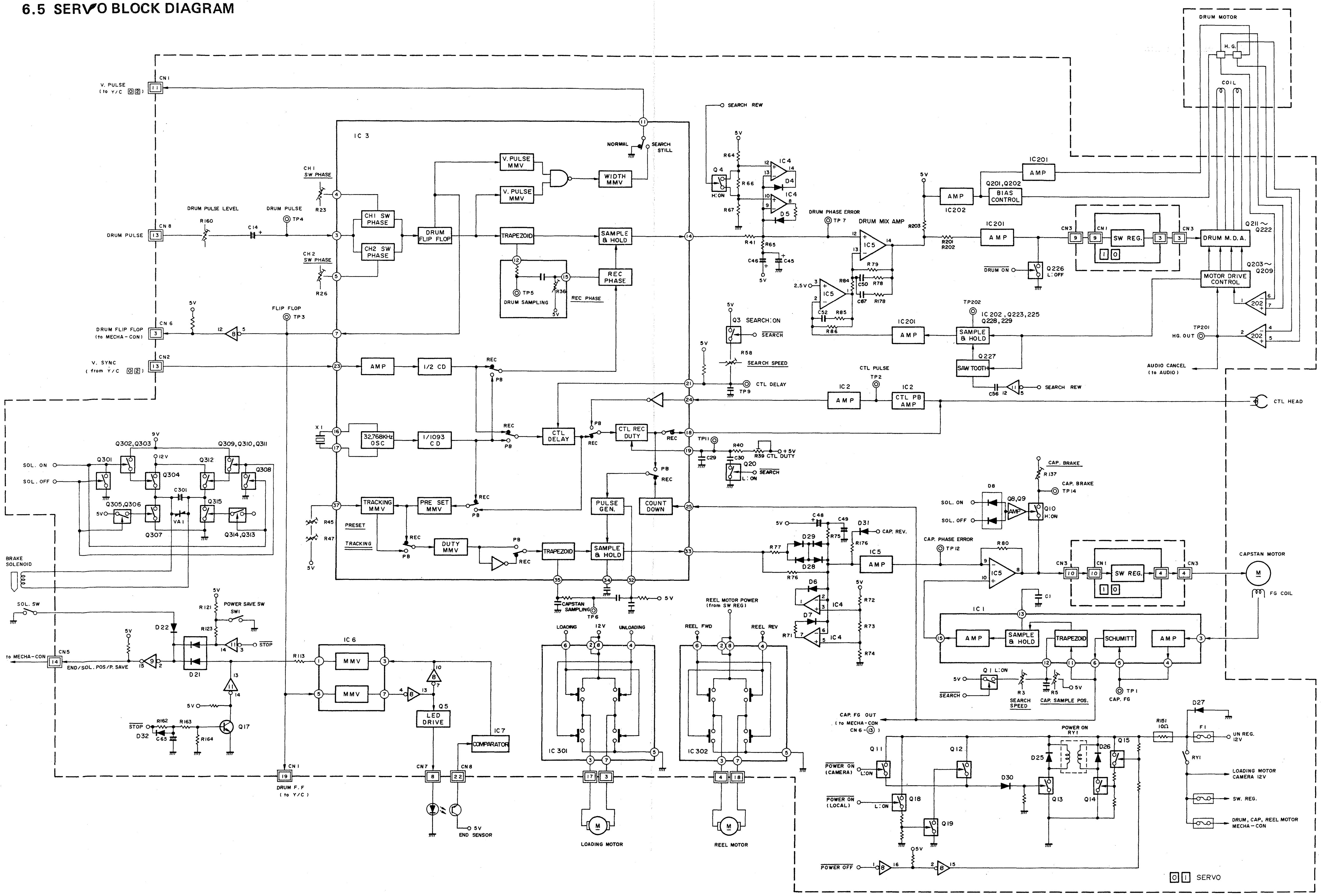
6.4.2 Color signal system


R66
3.58MHz OSC
TP36 3.58MHz OSC
TP41 AFC ADJ
from CN2-9 DRUM FF-IN
R56 AFC
IC7
3.58MHz VCO
SUB CONV
PHASE SHIFT
1/4
160fH VCO
REC
PB
TP33
BPF 2
1/160
AFC DET
REC/PB DET.
ACC DET
APC DET
KILLER DET
SYNC GATE
from IC6-26 SYNC IN
BURST GATE PULSE GEN.
REC 9V
to Y CIRCUIT
BPF 1
ACC AMP
MAIN CONV BURST EMPH KILLER AMP
LPF 3
EF
R40 REC COLOR LEVEL
TP5 REC COLOR
EQ 4
REC FM IN
REC AMP 1
IC2
V REC MUTE
TP4 REC FM
IC4
REC AMP2
C16
Q1
PB 9V
05 MECHACON
CAMERA CONNECTOR
CN1
CN5
TP1 VIDEO IN/OUT
RECORDING SIGNAL PATH
PLAYBACK SIGNAL PATH
R50
TP10 VIDEO OUT
E-E 9V
VIDEO OUT
OUTPUT AMP
CLAMP
EQ 6
IC 9
9V
01 SERVO & MDA
RF OUT
RF CONVERTER
from E-E AMP
Y/C MIX
PB Y SIGNAL
IC 6
R45 PB COLOR LEVEL
C501
Q3
TRAP L21,C59
V.PULSE
BURST DEEMPH KILLER AMP
DL 2
ACC AMP
BPF 1
MAIN CONV
TP34 PB COLOR
R47 PB IN COLOR LEVEL
PB COLOR AMP
IC 8
EQ5
LPF 4
BIAS TRAP C39, L 4
TP6 PB FM
to PB Y Circuit
ACC DET
KILLER DET
APC DET
BPF 2
from CN2-9 DRUM FF
TP33 SUB CONV OUT
PB 9V
I D AMP
3.58MHz VCO
SUB CONV
PHASE SHIFT
1/4
160fH VCO
BURST GATE PULSE GEN.
FREQ. DISCRI
SYNC GATE
from IC6-26 SYNC IN
R66 3.58MHz OSC
TP41 AFC ADJ
TP36 3.58MHz OSC
02 Y/C
03 PRE
TP1 REC FM
CN1
PB 9V
Q1
R8 CH-2Q
IC1
MIX AMP
AMP
AMP Q5
AMP Q4
C8 CH-2 fo
C7 CH-1 fo
Q3
Q2
REC 9V
DRUM FF IN
R9 CH-1 Q
CH-2
VIDEO HEADS
CH-1

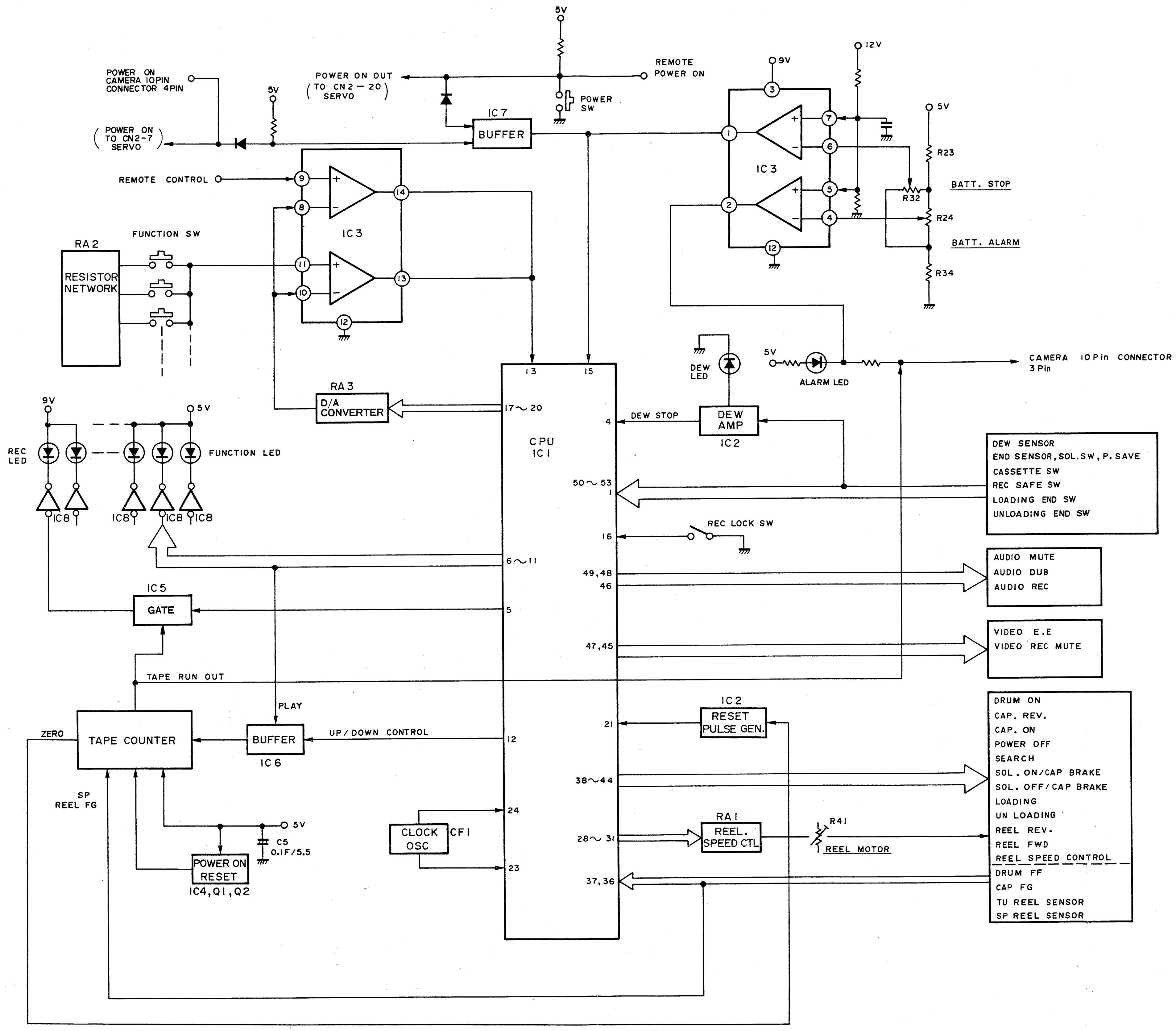
A B C D E F G H

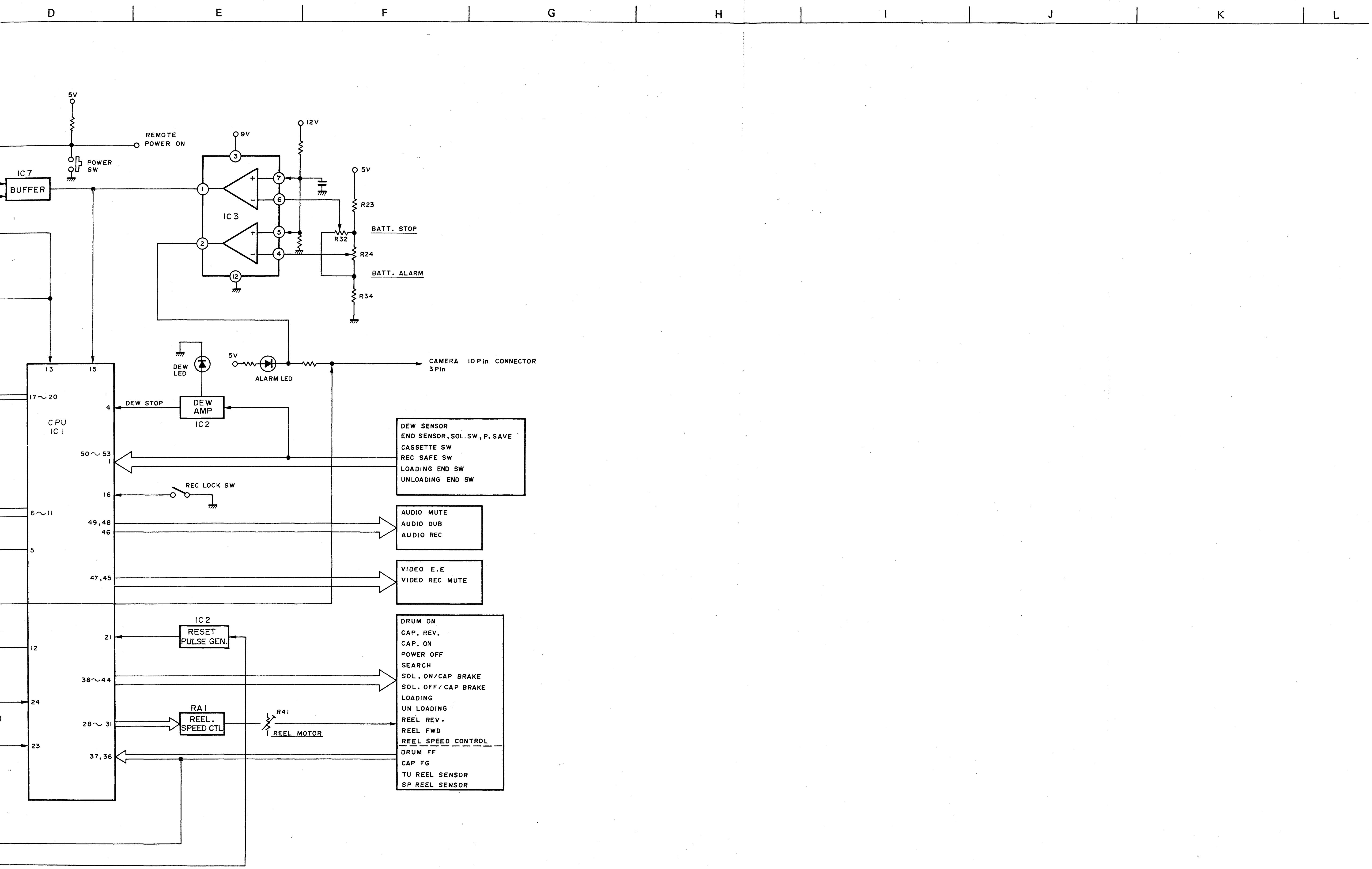
1 2 3 4 5 6

6.5 SERVO BLOCK DIAGRAM


V. PULSE (to Y/C 02)
CN1 1
IC3
NORMAL
SEARCH STILL
CH1 SW PHASE
R23
DRUM PULSE LEVEL
R160
C14
DRUM PULSE
TP4
CN8 13
DRUM PULSE
CH1 SW PHASE
CH2 SW PHASE
CH2 SW PHASE
R26
DRUM FLIP FLOP
V. PULSE MMV
V. PULSE MMV
WIDTH MMV
TRAPEZOID
SAMPLE & HOLD
REC PHASE
TP5
DRUM SAMPLING
R36
REC PHASE
DRUM FLIP FLOP (to MECHA-CON)
CN6 3
FLIP FLOP
TP3
V. SYNC (from Y/C 02)
CN2 13
AMP
1/2 CD
REC
PB
X1
32.768KHz OSC
1/1093 CD
CTL DELAY
CTL REC DUTY
TRACKING MMV
PRE SET MMV
PULSE GEN.
COUNT DOWN
R45
R47
PRESET
TRACKING
DUTY MMV
TRAPEZOID
SAMPLE & HOLD
CAPSTAN SAMPLING
TP6
SEARCH REW
Q4
H:ON
R64
R66
R67
IC4
D4
D5
DRUM PHASE ERROR
TP7
DRUM MIX AMP
R41
R65
C46
C45
IC5
R79
R84
C50
R78
C67
R178
R85
R86
2.5V
Q3 SEARCH:ON
SEARCH
R58
SEARCH SPEED
TP9
CTL DELAY
IC2 AMP
CTL PULSE
TP2
IC2 CTL PB AMP
CTL HEAD
TP11
R40
R39 CTL DUTY
C29
C30
Q20
L:ON
SEARCH
AMP
IC202
R203
Q201,Q202
BIAS CONTROL
IC201 AMP
IC201 AMP
R201
R202
DRUM ON
Q226 L:OFF
CN3
CN1
SW REG.
1 0
DRUM M.D.A.
Q211 ~ Q222
Q203 ~ Q209
MOTOR DRIVE CONTROL
DRUM MOTOR
H. G.
COIL
TP202
IC202, Q223, 225 Q228, 229
IC201 AMP
SAMPLE & HOLD
Q227
SAW TOOTH
C56
SEARCH REW
TP201
HG. OUT
202
AUDIO CANCEL (to AUDIO)
Q302, Q303
Q309, Q310, Q311
SOL. ON
SOL. OFF
Q301
Q304
Q312
Q308
C301
Q305, Q306
Q315
VA1
Q307
Q314, Q313
BRAKE SOLENOID
SOL. SW
POWER SAVE SW
SW1
R121
R123
D22
STOP
to MECHA-CON
CN5 14
END/SOL. POS/P. SAVE
D21
R113
IC6
MMV
MMV
R162
R163
Q17
D32
C65
R164
Q5
LED DRIVE
IC7
COMPARATOR
CN1 19
DRUM F.F (to Y/C)
CN7 8
CN8 22
END SENSOR
C48
C49
D31
CAP. REV.
D29
R75
R176
D28
R77
R76
IC5 AMP
D6
D7
IC4
R71
R72
R73
R74
CAP. BRAKE
R137
CAP. BRAKE
TP14
D8
Q8, Q9
Q10 H:ON
CAP. PHASE ERROR
TP12
R80
IC5
C1
SW REG.
CAPSTAN MOTOR
FG COIL
IC1
AMP
SAMPLE & HOLD
TRAPEZOID
SCHUMITT
AMP
Q1 L:ON
R3
R5
SEARCH
SEARCH SPEED
CAP. SAMPLE POS.
TP1
CAP. FG
REEL MOTOR POWER (from SW REG)
LOADING
UNLOADING
REEL FWD
REEL REV
IC301
IC302
CN1 17 3
4 18
LOADING MOTOR
REEL MOTOR
CAP. FG OUT (to MECHA-CON CN6-13)
POWER ON (CAMERA)
POWER ON (LOCAL)
POWER OFF
Q11 L:ON
Q12
Q18 L:ON
Q19
D30
Q13
D25
POWER ON RY1
D26
Q14
Q15
R151 10Ω
D27
F1
RY1
UN REG. 12V
LOADING MOTOR CAMERA 12V
SW. REG.
DRUM, CAP, REEL MOTOR MECHA-CON
01 SERVO

6.6 MECHANISM CONTROL BLOCK DIAGRAM

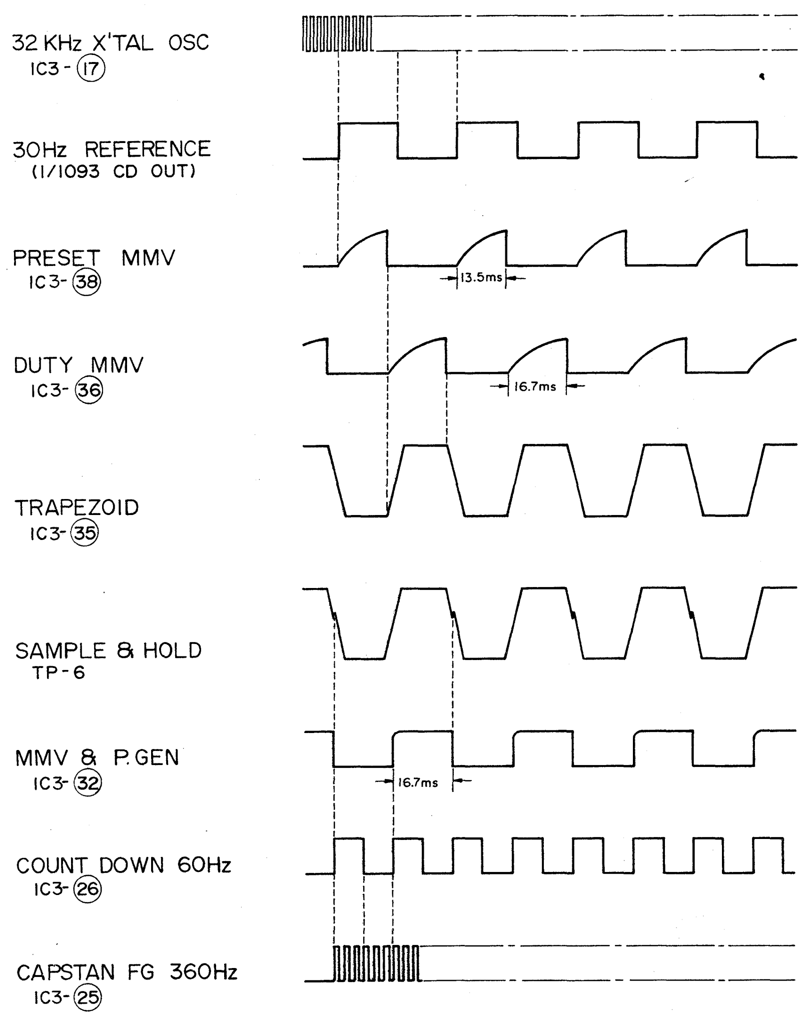

5V
REMOTE POWER ON
POWER SW
POWER ON OUT (TO CN2 — 20 SERVO)
POWER ON CAMERA 10PIN CONNECTOR 4PIN
5V
IC7
BUFFER
(POWER ON TO CN2-7 SERVO)
REMOTE CONTROL
9
8
14
IC3
11
10
13
12
RA2
RESISTOR NETWORK
FUNCTION SW
RA3
D/A CONVERTER
9V
5V
REC LED
FUNCTION LED
IC8
IC8
IC8
IC8
IC5
GATE
TAPE RUN OUT
PLAY
ZERO
TAPE COUNTER
BUFFER
IC6
UP/DOWN CONTROL
SP REEL FG
5V
C5 0.1F/5.5
POWER ON RESET
IC4, Q1, Q2
CLOCK OSC
CF1
CPU IC1
13
15
17～20
4
50～53
1
16
6～11
49,48
46
5
47,45
12
21
38～44
24
28～31
23
37,36
9V
12V
IC3
3
7
6
5
4
1
2
12
5V
R23
R32
BATT. STOP
R24
BATT. ALARM
R34
DEW LED
5V
ALARM LED
CAMERA 10Pin CONNECTOR 3Pin
DEW STOP
DEW AMP
IC2
DEW SENSOR
END SENSOR, SOL. SW, P. SAVE
CASSETTE SW
REC SAFE SW
LOADING END SW
UNLOADING END SW
REC LOCK SW
AUDIO MUTE
AUDIO DUB
AUDIO REC
VIDEO E.E
VIDEO REC MUTE
IC2
RESET PULSE GEN.
RA1
REEL. SPEED CTL
R41
REEL MOTOR
DRUM ON
CAP. REV.
CAP. ON
POWER OFF
SEARCH
SOL. ON/CAP BRAKE
SOL. OFF/CAP BRAKE
LOADING
UN LOADING
REEL REV.
REEL FWD
REEL SPEED CONTROL
DRUM FF
CAP FG
TU REEL SENSOR
SP REEL SENSOR


D
E
F
G
H
I
J
K
L
5V
REMOTE POWER ON
POWER SW
IC7
BUFFER
9V
12V
5V
IC3
R23
R32
BATT. STOP
R24
BATT. ALARM
R34
DEW LED
5V
ALARM LED
CAMERA 10Pin CONNECTOR 3Pin
13
15
17～20
CPU IC1
4
DEW STOP
DEW AMP
IC2
DEW SENSOR
END SENSOR, SOL. SW, P. SAVE
CASSETTE SW
REC SAFE SW
LOADING END SW
UNLOADING END SW
50～53
1
16
REC LOCK SW
6～11
49,48
46
AUDIO MUTE
AUDIO DUB
AUDIO REC
5
47,45
VIDEO E.E
VIDEO REC MUTE
IC2
RESET PULSE GEN.
21
12
38～44
DRUM ON
CAP. REV.
CAP. ON
POWER OFF
SEARCH
SOL. ON/CAP BRAKE
SOL. OFF/CAP BRAKE
LOADING
UN LOADING
REEL REV.
REEL FWD
REEL SPEED CONTROL
DRUM FF
CAP FG
TU REEL SENSOR
SP REEL SENSOR
24
RA1
REEL. SPEED CTL.
R41
REEL MOTOR
28～31
23
37,36

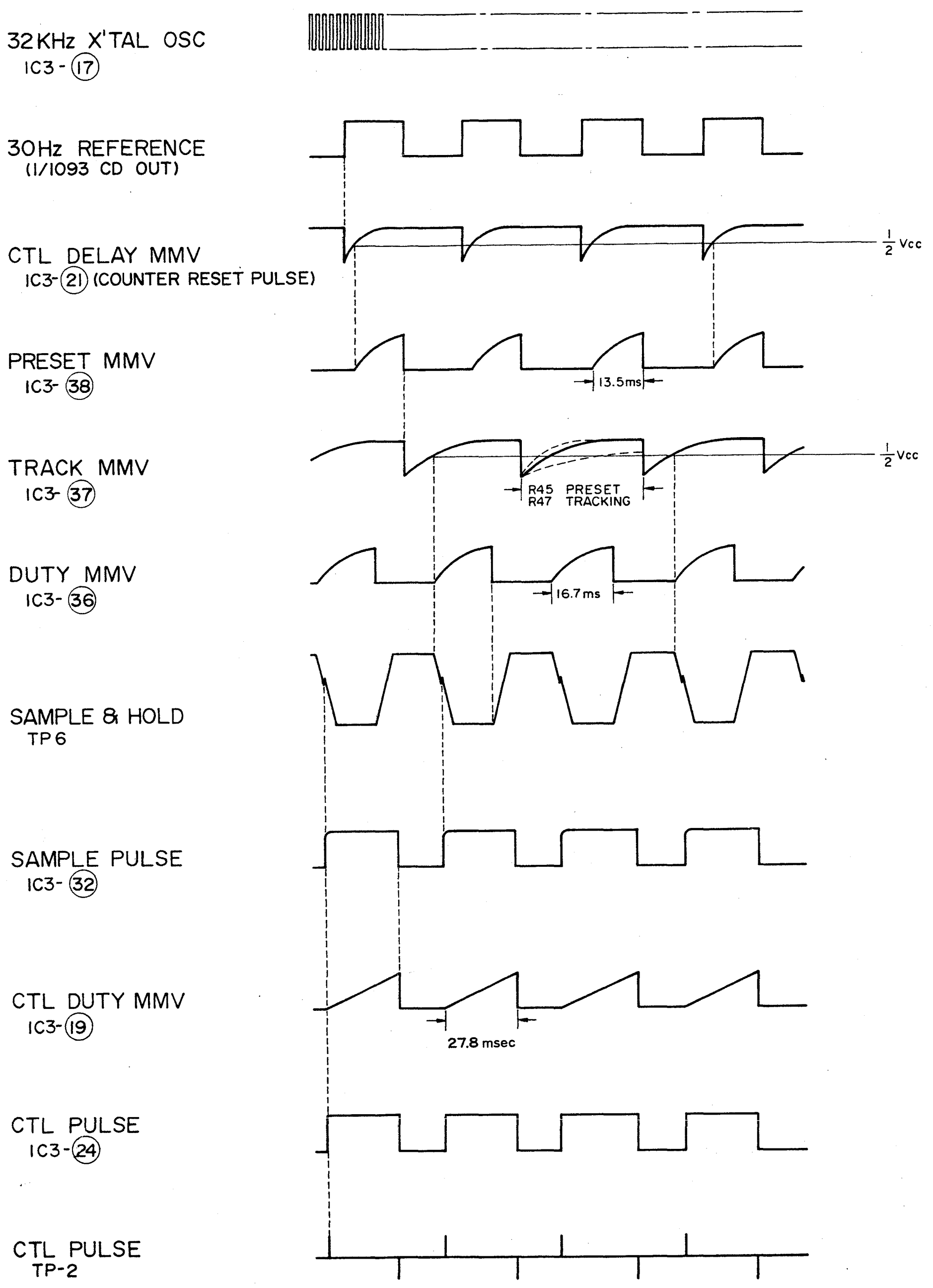
6.7 SERVO TIMING CHARTS

1. CAPSTAN SERVO

– RECORD MODE –

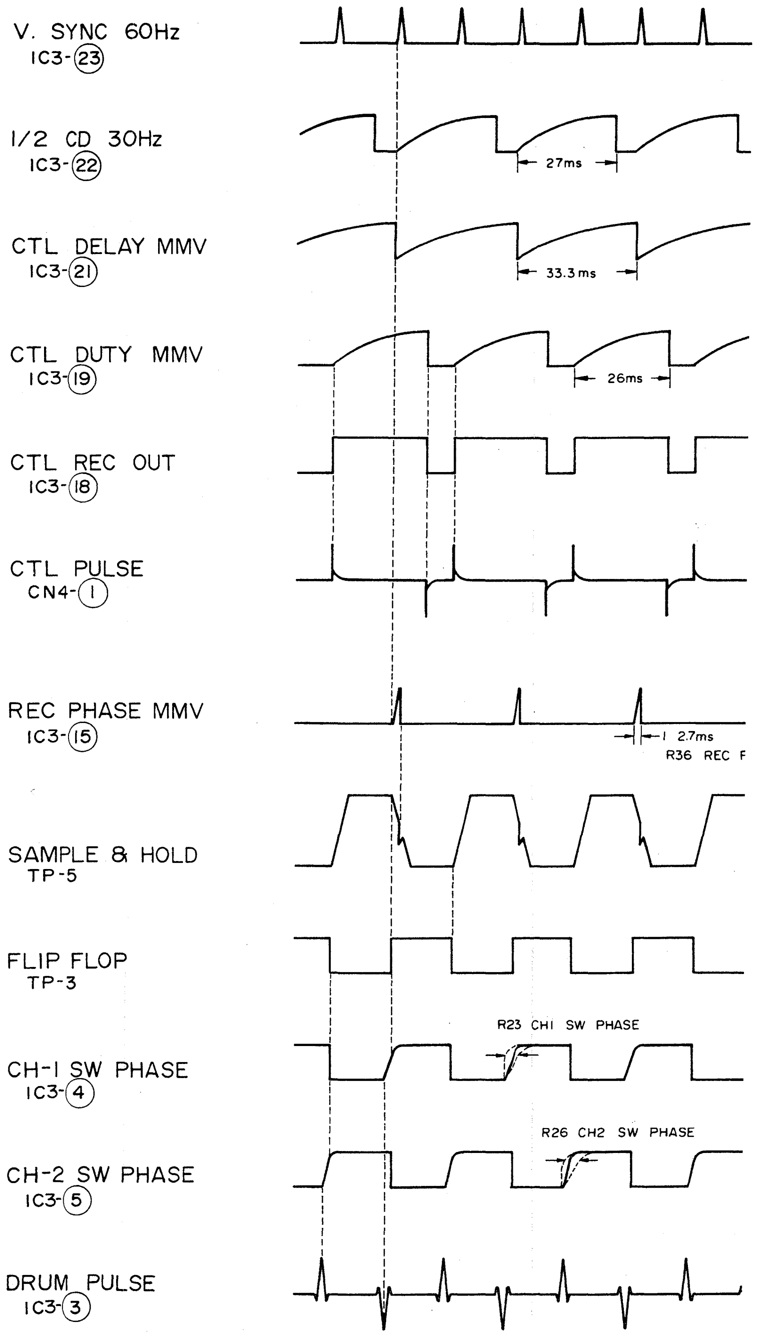

32 KHz X'TAL OSC
IC3-⑰
30Hz REFERENCE
(1/1093 CD OUT)
PRESET MMV
IC3-㊳
13.5ms
DUTY MMV
IC3-㊱
16.7ms
TRAPEZOID
IC3-㉟
SAMPLE & HOLD
TP-6
MMV & P.GEN
IC3-㉜
16.7ms
COUNT DOWN 60Hz
IC3-㉖
CAPSTAN FG 360Hz
IC3-㉕

– PB MODE –

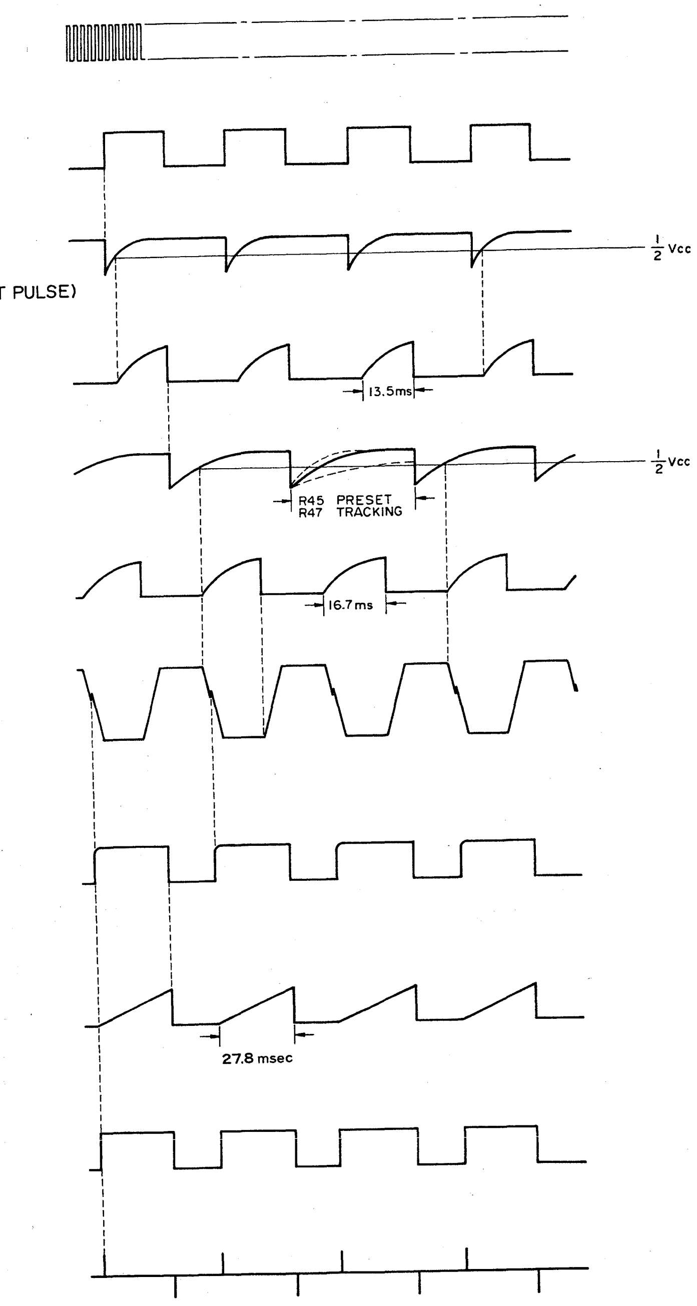

32KHz X'TAL OSC
IC3-⑰
30Hz REFERENCE
(1/1093 CD OUT)
CTL DELAY MMV
IC3-㉑ (COUNTER RESET PULSE)
1/2 Vcc
PRESET MMV
IC3-㊳
13.5ms
TRACK MMV
IC3-㊲
1/2 Vcc
R45 PRESET
R47 TRACKING
DUTY MMV
IC3-㊱
16.7ms
SAMPLE & HOLD
TP6
SAMPLE PULSE
IC3-㉜
CTL DUTY MMV
IC3-⑲
27.8 msec
CTL PULSE
IC3-㉔
CTL PULSE
TP-2

2. DRUM SERVO

– RECORD MODE –

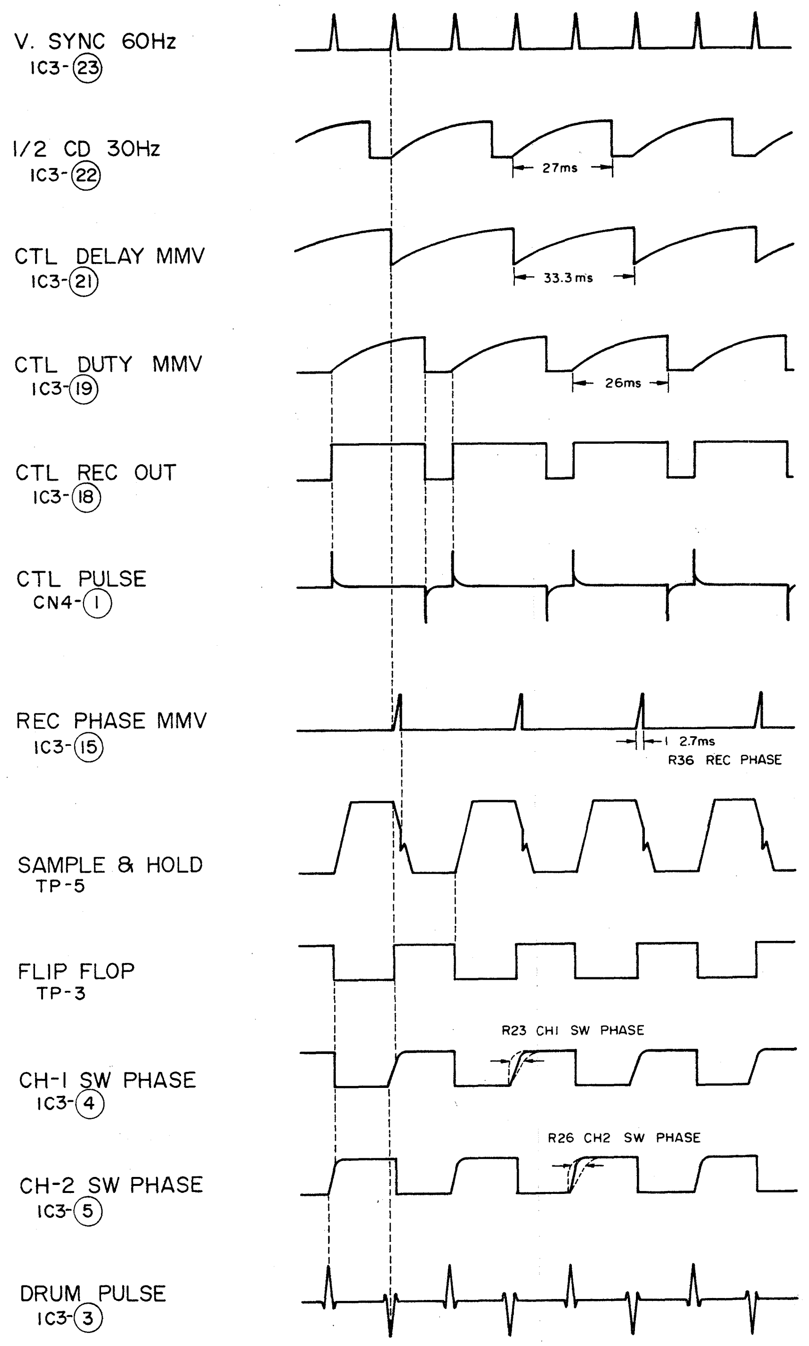

V. SYNC 60Hz
IC3-㉓
1/2 CD 30Hz
IC3-㉒
27ms
CTL DELAY MMV
IC3-㉑
33.3ms
CTL DUTY MMV
IC3-⑲
26ms
CTL REC OUT
IC3-⑱
CTL PULSE
CN4-①
REC PHASE MMV
IC3-⑮
2.7ms
R36 REC
SAMPLE & HOLD
TP-5
FLIP FLOP
TP-3
R23 CH1 SW PHASE
CH-1 SW PHASE
IC3-④
R26 CH2 SW PHASE
CH-2 SW PHASE
IC3-⑤
DRUM PULSE
IC3-③

– PB MODE –

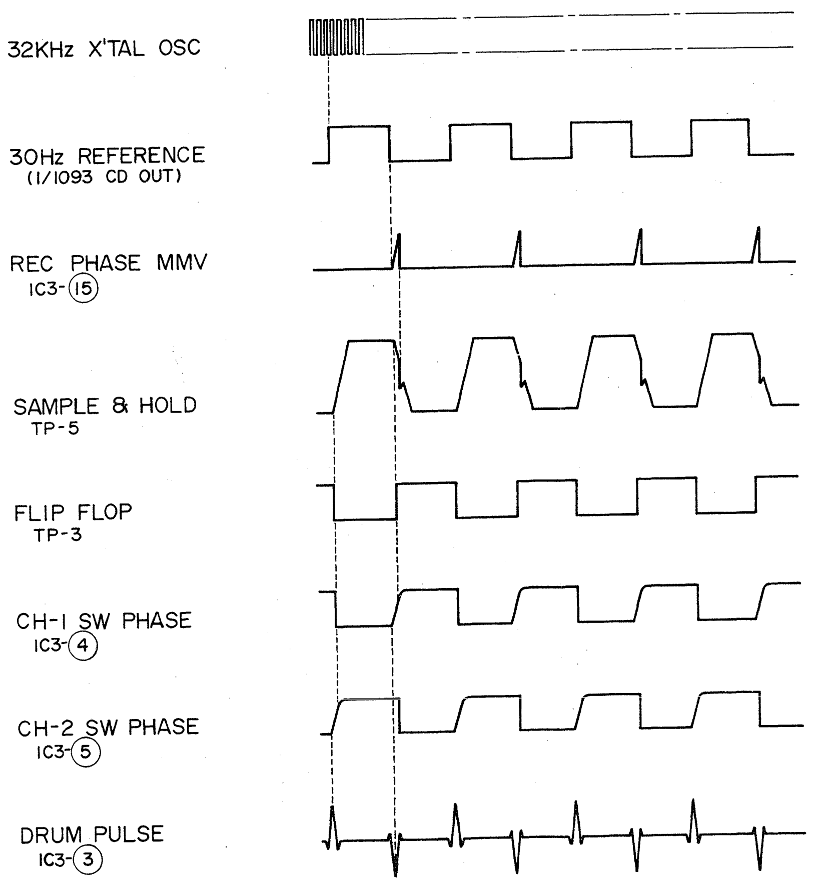


2. DRUM SERVO

– RECORD MODE –

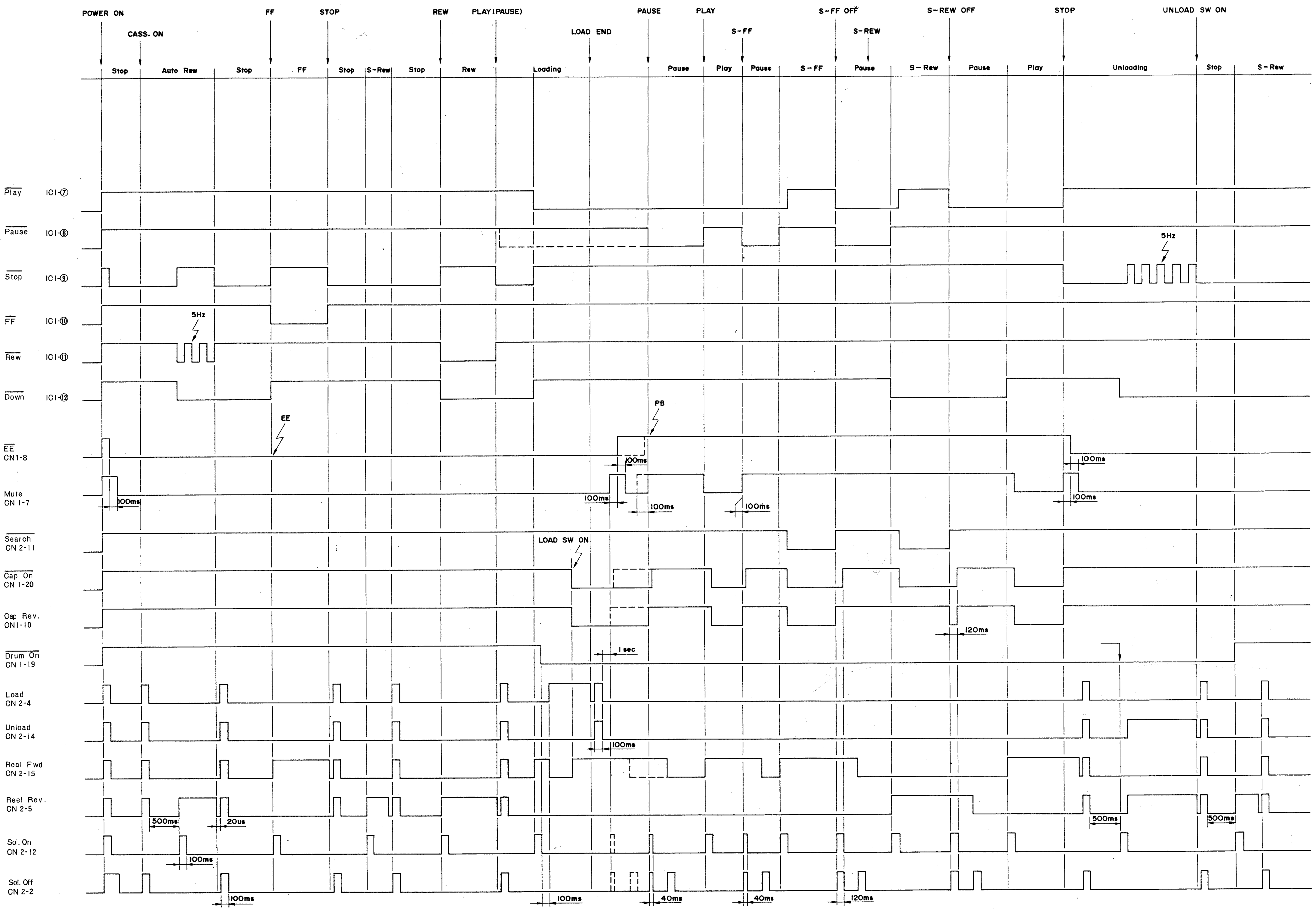


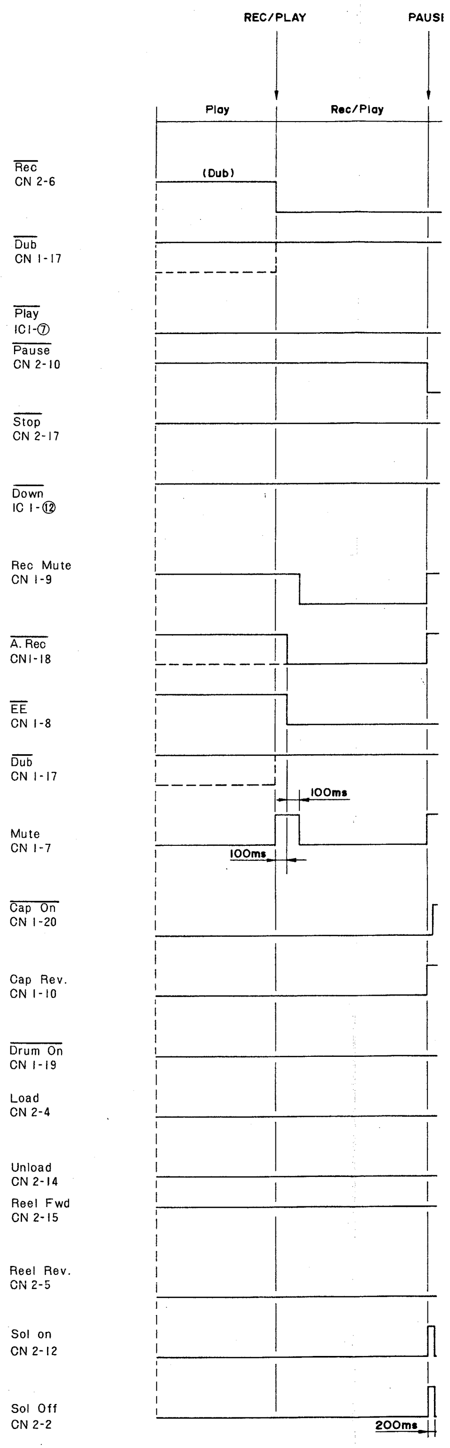
– PB MODE –



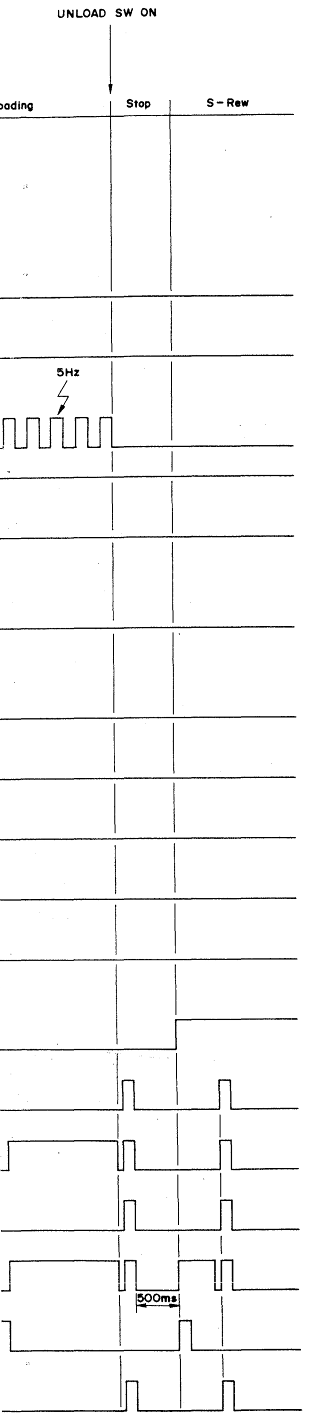
6.8 MECHANISM CONTROL TIMING CHART

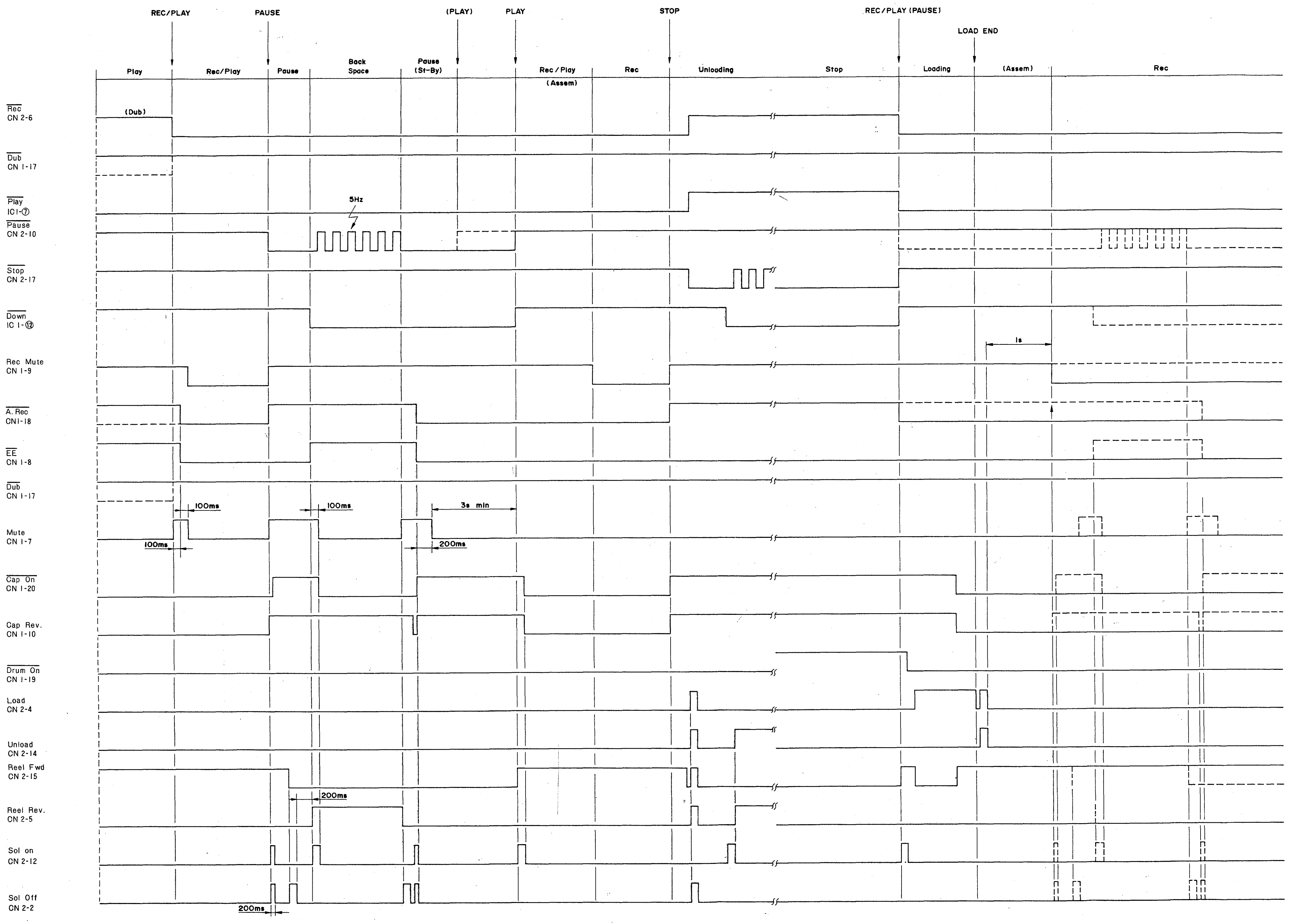
– POWER ON, FF, REW & PB MODE –

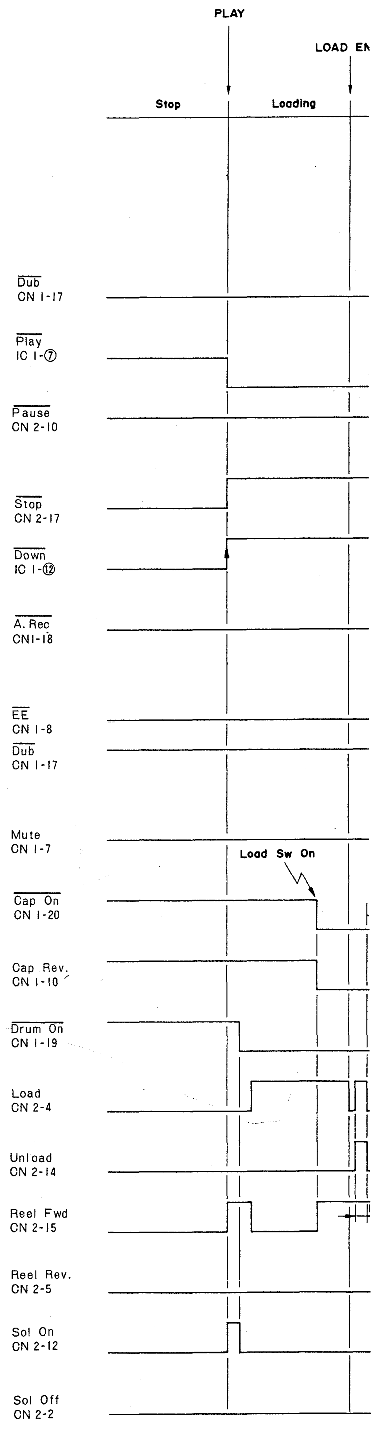

POWER ON
CASS. ON
FF
STOP
REW
PLAY(PAUSE)
LOAD END
PAUSE
PLAY
S-FF
S-FF OFF
S-REW
S-REW OFF
STOP
UNLOAD SW ON
Stop
Auto Rew
Stop
FF
Stop
S-Rew
Stop
Rew
Loading
Pause
Play
Pause
S-FF
Pause
S-Rew
Pause
Play
Unloading
Stop
S-Rew
Play IC1-⑦
Pause IC1-⑧
Stop IC1-⑨
FF IC1-⑩
Rew IC1-⑪
Down IC1-⑫
EE CN1-8
Mute CN 1-7
Search CN 2-11
Cap On CN 1-20
Cap Rev. CN1-10
Drum On CN 1-19
Load CN 2-4
Unload CN 2-14
Reel Fwd CN 2-15
Reel Rev. CN 2-5
Sol. On CN 2-12
Sol. Off CN 2-2
5Hz
5Hz
EE
PB
LOAD SW ON
100ms
100ms
100ms
100ms
100ms
100ms
100ms
100ms
1 sec
120ms
100ms
500ms
20us
100ms
500ms
500ms
100ms
100ms
40ms
40ms
120ms


REC/PLAY
PAUSE
Play
Rec/Play
(Dub)
Rec CN 2-6
Dub CN 1-17
Play IC1-⑦
Pause CN 2-10
Stop CN 2-17
Down IC 1-⑫
Rec Mute CN 1-9
A. Rec CN1-18
EE CN 1-8
Dub CN 1-17
Mute CN 1-7
Cap On CN 1-20
Cap Rev. CN 1-10
Drum On CN 1-19
Load CN 2-4
Unload CN 2-14
Reel Fwd CN 2-15
Reel Rev. CN 2-5
Sol on CN 2-12
Sol Off CN 2-2
100ms
100ms
200ms

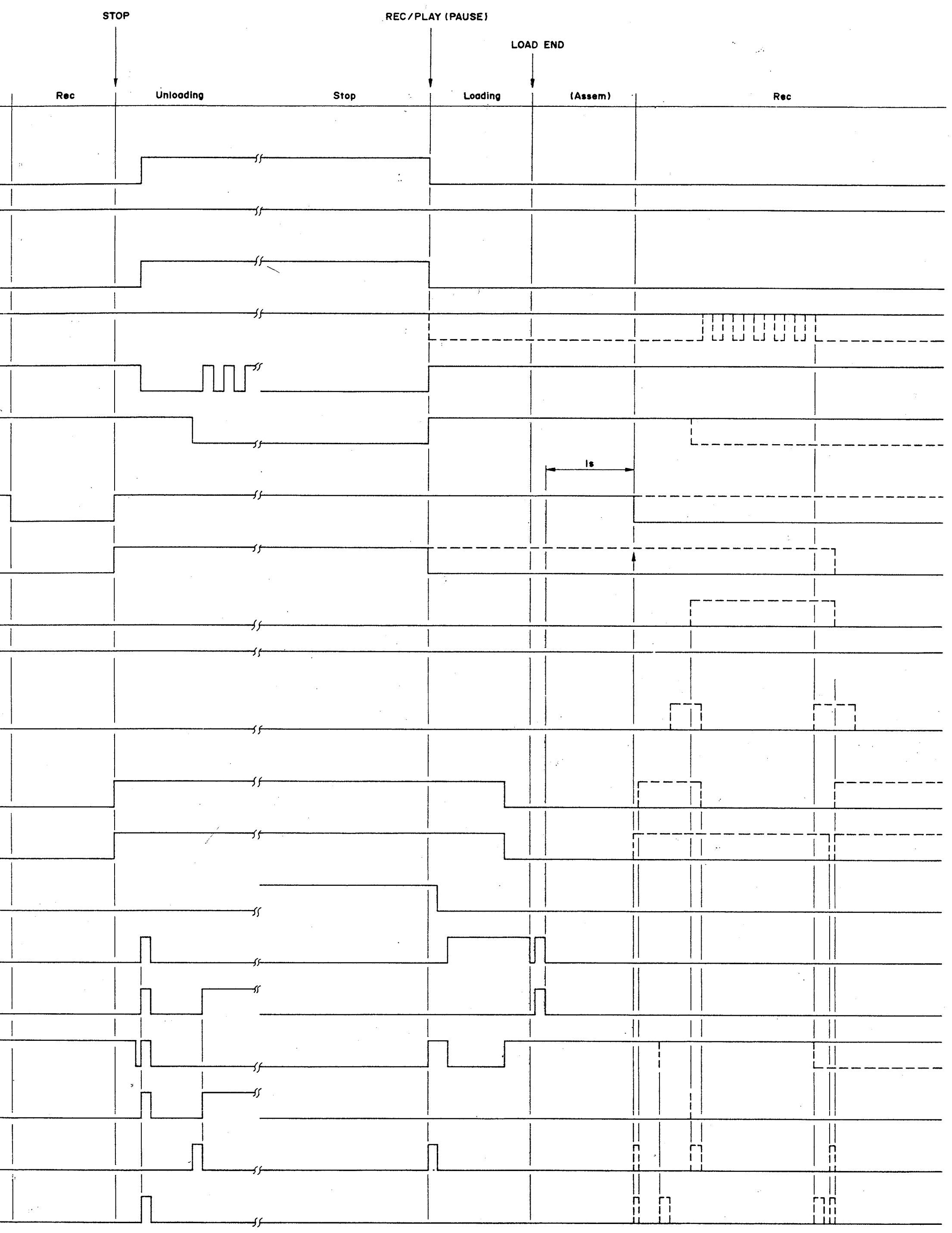
– RECORD MODE –


UNLOAD SW ON
oading
Stop
S – Rew
5Hz
500ms

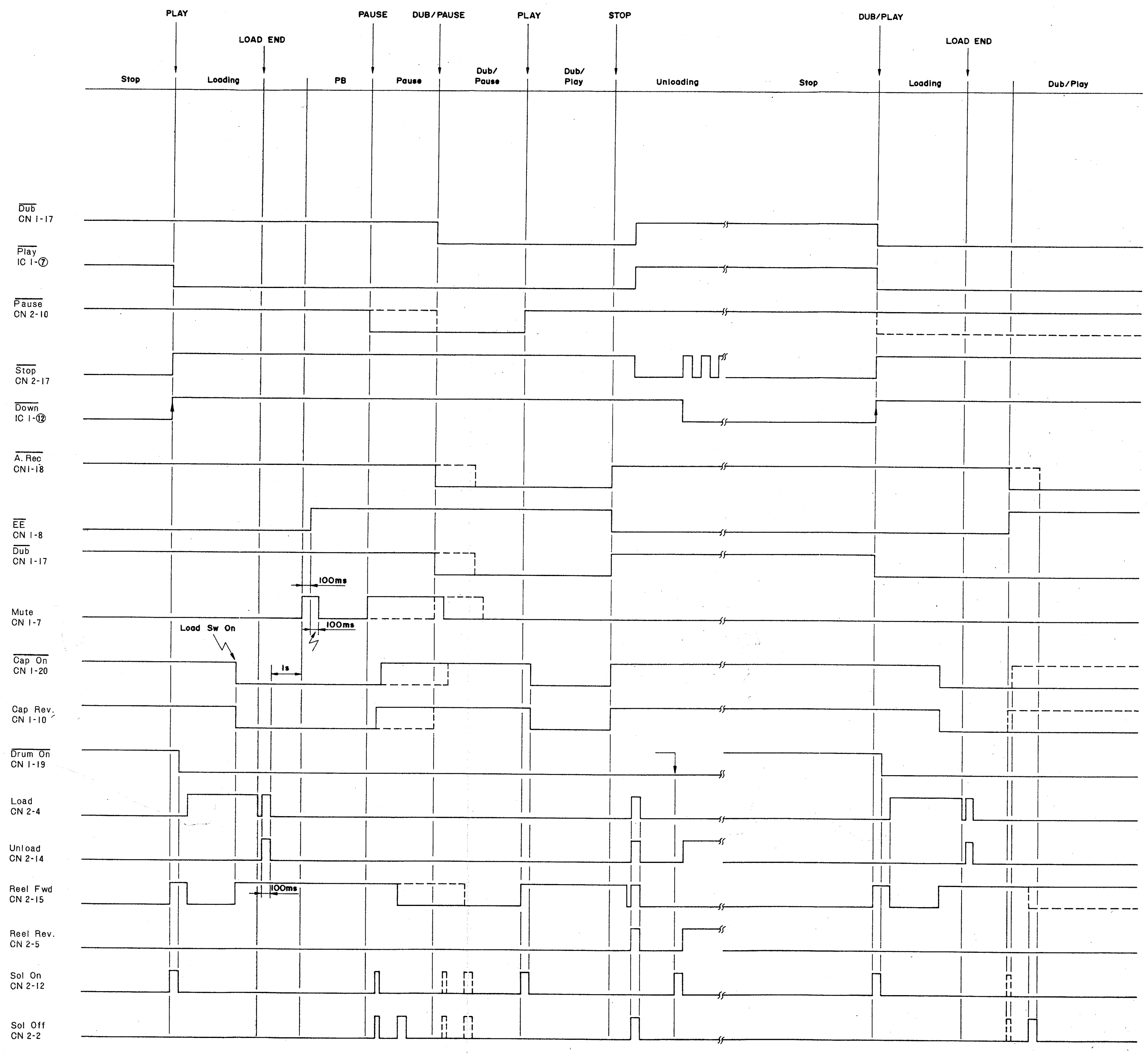

REC/PLAY
PAUSE
(PLAY)
PLAY
STOP
REC/PLAY (PAUSE)
LOAD END
Play
Rec/Play
Pause
Back Space
Pause (St-By)
Rec/Play (Assem)
Rec
Unloading
Stop
Loading
(Assem)
Rec
Rec CN 2-6
(Dub)
Dub CN 1-17
Play IC1-⑦
Pause CN 2-10
5Hz
Stop CN 2-17
Down IC 1-⑫
Rec Mute CN 1-9
1s
A. Rec CN1-18
EE CN 1-8
Dub CN 1-17
Mute CN 1-7
100ms
100ms
100ms
3s min
200ms
Cap On CN 1-20
Cap Rev. CN 1-10
Drum On CN 1-19
Load CN 2-4
Unload CN 2-14
Reel Fwd CN 2-15
200ms
Reel Rev. CN 2-5
Sol on CN 2-12
Sol Off CN 2-2
200ms


PLAY
LOAD EN
Stop
Loading
Dub CN 1-17
Play IC 1-⑦
Pause CN 2-10
Stop CN 2-17
Down IC 1-⑫
A. Rec CN1-18
EE CN 1-8
Dub CN 1-17
Mute CN 1-7
Load Sw On
Cap On CN 1-20
Cap Rev. CN 1-10
Drum On CN 1-19
Load CN 2-4
Unload CN 2-14
Reel Fwd CN 2-15
Reel Rev. CN 2-5
Sol On CN 2-12
Sol Off CN 2-2

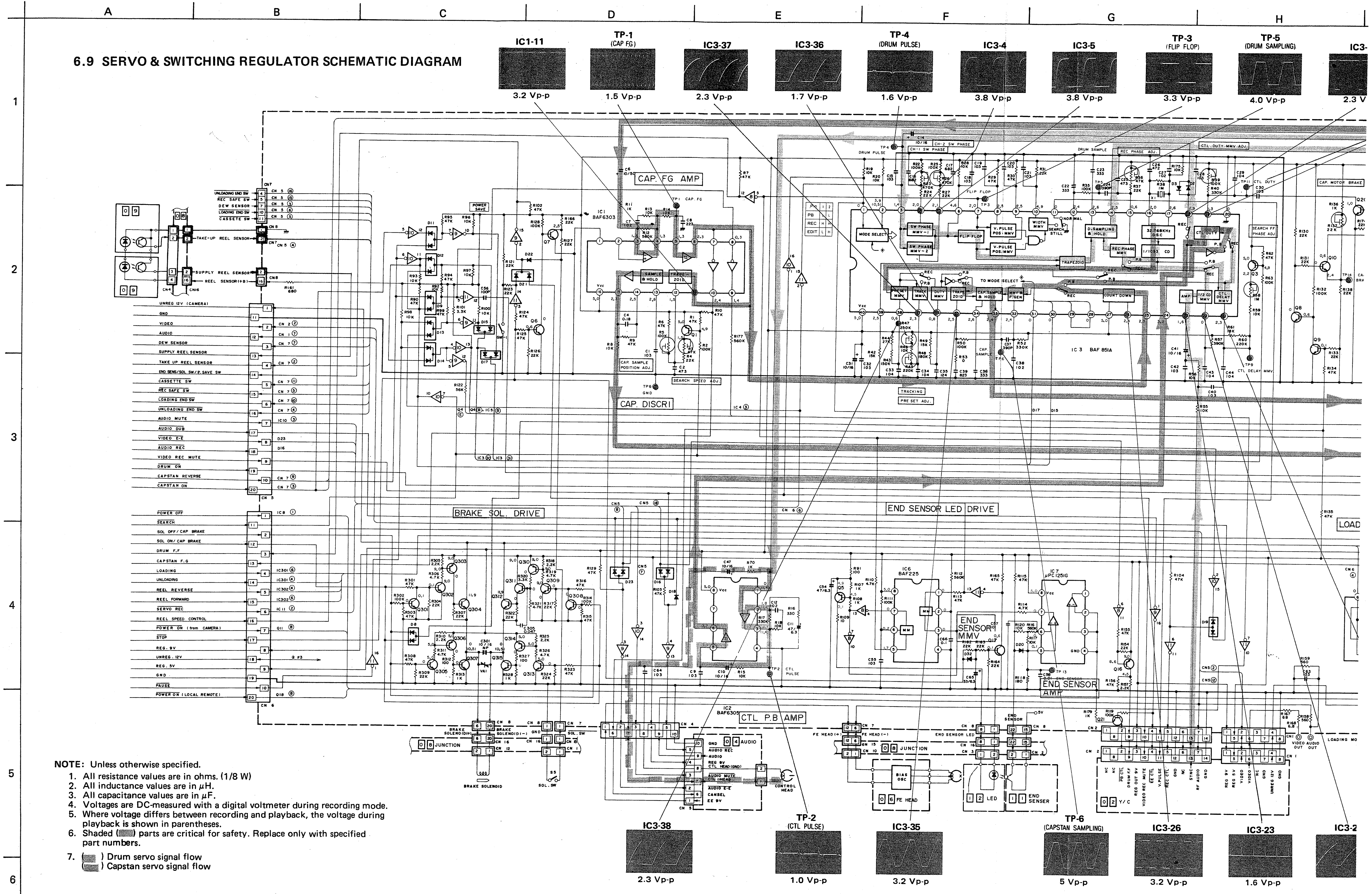
ECORD MODE –


STOP
REC/PLAY (PAUSE)
LOAD END
Rec
Unloading
Stop
Loading
(Assem)
Rec
1s

– AUDIO DUB MODE –

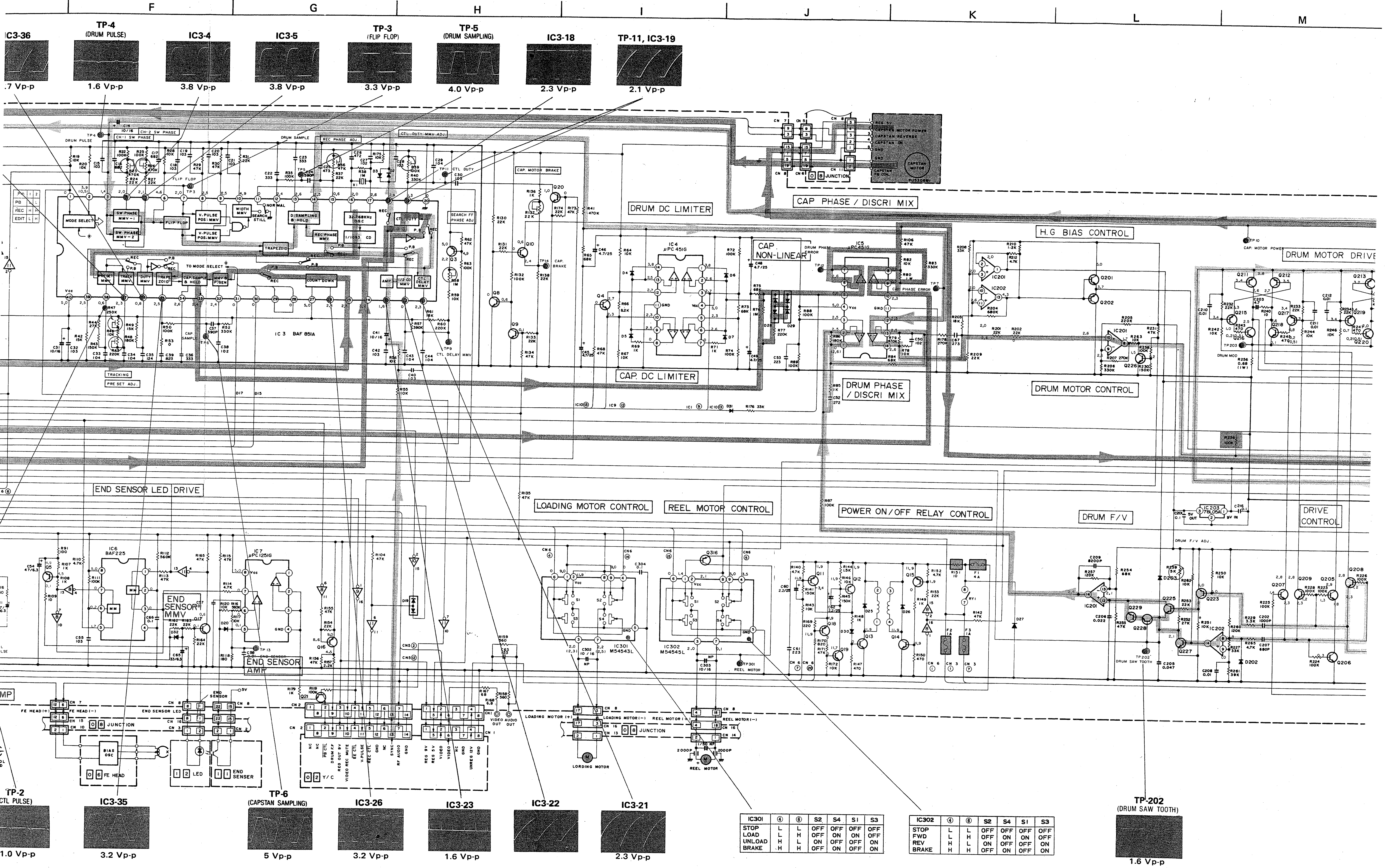

PLAY
LOAD END
PAUSE
DUB/PAUSE
PLAY
STOP
DUB/PLAY
LOAD END
Stop
Loading
PB
Pause
Dub/Pause
Dub/Play
Unloading
Stop
Loading
Dub/Play
Dub CN 1-17
Play IC 1-⑦
Pause CN 2-10
Stop CN 2-17
Down IC 1-⑫
A. Rec CN1-18
EE CN 1-8
Dub CN 1-17
100ms
Mute CN 1-7
Load Sw On
100ms
1s
Cap On CN 1-20
Cap Rev. CN 1-10
Drum On CN 1-19
Load CN 2-4
Unload CN 2-14
Reel Fwd CN 2-15
100ms
Reel Rev. CN 2-5
Sol On CN 2-12
Sol Off CN 2-2

6.9 SERVO & SWITCHING REGULATOR SCHEMATIC DIAGRAM


A
B
C
D
E
F
G
H
1
2
3
4
5
6
IC1-11
3.2 Vp-p
TP-1
(CAP FG)
1.5 Vp-p
IC3-37
2.3 Vp-p
IC3-36
1.7 Vp-p
TP-4
(DRUM PULSE)
1.6 Vp-p
IC3-4
3.8 Vp-p
IC3-5
3.8 Vp-p
TP-3
(FLIP FLOP)
3.3 Vp-p
TP-5
(DRUM SAMPLING)
4.0 Vp-p
2.3 V
CAP. FG AMP
IC1
BAF6303
CAP. DISCRI
SAMPLE & HOLD
TRAPEZOID
IC 3 BAF 851A
MODE SELECT
SW PHASE MMV-1
SW PHASE MMV-2
FLIP FLOP
V. PULSE POS-MMV
WIDTH MMV
SEARCH STILL
D-SAMPLING & HOLD
32.768KHz OSC
1/1093 CD
REC PHASE MMV
CTL DUTY
SEARCH FF PHASE ADJ.
CH-1 SW PHASE
CH-2 SW PHASE
DRUM SAMPLE
REC PHASE ADJ.
CTL DUTY MMV ADJ.
CAP. MOTOR BRAKE
PRESET MMV
TRACK MMV
DUTY MMV
TRAPEZOID
CAP. SAMPLE & HOLD
MMV & P.GEN
COUNT DOWN
AMP
1/2 CD MMV
CTL DELAY MMV
TO MODE SELECT
TRACKING
PRE SET ADJ.
CAP. SAMPLE POSITION ADJ.
SEARCH SPEED ADJ.
TAKE-UP REEL SENSOR
SUPPLY REEL SENSOR
REEL SENSOR (+B)
UNLOADING END SW
REC SAFE SW
DEW SENSOR
LOADING END SW
CASSETE SW
UNREG 12V (CAMERA)
GND
VIDEO
AUDIO
DEW SENSOR
SUPPLY REEL SENSOR
TAKE UP REEL SENSOR
END SENS/SOL SW/P. SAVE SW
CASSETTE SW
REC SAFE SW
LOADING END SW
UNLOADING END SW
AUDIO MUTE
AUDIO DUB
VIDEO E-E
AUDIO REC
VIDEO REC MUTE
DRUM ON
CAPSTAN REVERSE
CAPSTAN ON
POWER OFF
SEARCH
SOL OFF/CAP BRAKE
SOL ON/CAP BRAKE
DRUM F.F
CAPSTAN F.G
LOADING
UNLOADING
REEL REVERSE
REEL FORWARD
SERVO REC
REEL SPEED CONTROL
POWER ON (from CAMERA)
STOP
REG. 9V
UNREG. 12V
REG. 5V
GND
PAUSE
POWER ON (LOCAL REMOTE)
POWER SAVE
BRAKE SOL. DRIVE
END SENSOR LED DRIVE
IC6 BAF225
IC7 μPC1251G
END SENSOR MMV
END SENSOR AMP
IC2 BAF6305
CTL P.B AMP
LOAD
BRAKE SOLENOID(+)
BRAKE SOLENOID(-)
BRAKE SOLENOID
SOL. SW
JUNCTION
GND
AUDIO
AUDIO REC
REG 9V
CTL HEAD(GND)
AUDIO MUTE
CTL HEAD
AUDIO E-E
CANSEL
EE 9V
CONTROL HEAD
FE HEAD(+)
FE HEAD(-)
BIAS OSC
FE HEAD
END SENSOR LED
LED
END SENSER
Y/C
VIDEO OUT
AUDIO OUT
LOADING MO
TP-2
(CTL PULSE)
1.0 Vp-p
IC3-38
2.3 Vp-p
IC3-35
3.2 Vp-p
TP-6
(CAPSTAN SAMPLING)
5 Vp-p
IC3-26
3.2 Vp-p
IC3-23
1.6 Vp-p
IC3-2

NOTE: Unless otherwise specified.

1. All resistance values are in ohms. (1/8 W)
2. All inductance values are in μH.
3. All capacitance values are in μF.
4. Voltages are DC-measured with a digital voltmeter during recording mode.
5. Where voltage differs between recording and playback, the voltage during playback is shown in parentheses.
6. Shaded (▨) parts are critical for safety. Replace only with specified part numbers.
7. (▨) Drum servo signal flow
   (▨) Capstan servo signal flow


F
G
H
I
J
K
L
M
IC3-36
.7 Vp-p
TP-4
(DRUM PULSE)
1.6 Vp-p
IC3-4
3.8 Vp-p
IC3-5
3.8 Vp-p
TP-3
(FLIP FLOP)
3.3 Vp-p
TP-5
(DRUM SAMPLING)
4.0 Vp-p
IC3-18
2.3 Vp-p
TP-11, IC3-19
2.1 Vp-p
MODE SELECT
FLIP FLOP
V. PULSE POS. MMV
WIDTH MMV
D/SAMPLING & HOLD
REC PHASE MMV
32.768KHz OSC
1/1093 CD
CTL DUTY
TRAPEZOID
COUNT DOWN
CAP. SAMPLE & HOLD
MMV & P. GEN
IC 3 BAF 851A
TRACKING
PRE SET ADJ.
DRUM SAMPLE
REC PHASE ADJ.
CTL DUTY MMV ADJ.
CAP. MOTOR BRAKE
SEARCH FF PHASE ADJ
CTL DELAY MMV
DRUM DC LIMITER
CAP. DC LIMITER
CAP. NON-LINEAR
IC4 μPC451G
IC5 μPC451G
CAP PHASE / DISCRI MIX
DRUM PHASE / DISCRI MIX
CAPSTAN MOTOR
JUNCTION
H.G BIAS CONTROL
DRUM MOTOR DRIVE
DRUM MOTOR CONTROL
END SENSOR LED DRIVE
IC6 BAF225
IC7 μPC1251G
END SENSOR MMV
END SENSOR AMP
LOADING MOTOR CONTROL
REEL MOTOR CONTROL
IC301 M54543L
IC302 M54545L
POWER ON/OFF RELAY CONTROL
DRUM F/V
DRIVE CONTROL
IC203 78L05A
LORDING MOTOR
REEL MOTOR
BIAS OSC
FE HEAD
LED
END SENSER
Y/C
TP-2
(CTL PULSE)
1.0 Vp-p
IC3-35
3.2 Vp-p
TP-6
(CAPSTAN SAMPLING)
5 Vp-p
IC3-26
3.2 Vp-p
IC3-23
1.6 Vp-p
IC3-22
IC3-21
2.3 Vp-p
TP-202
(DRUM SAW TOOTH)
1.6 Vp-p

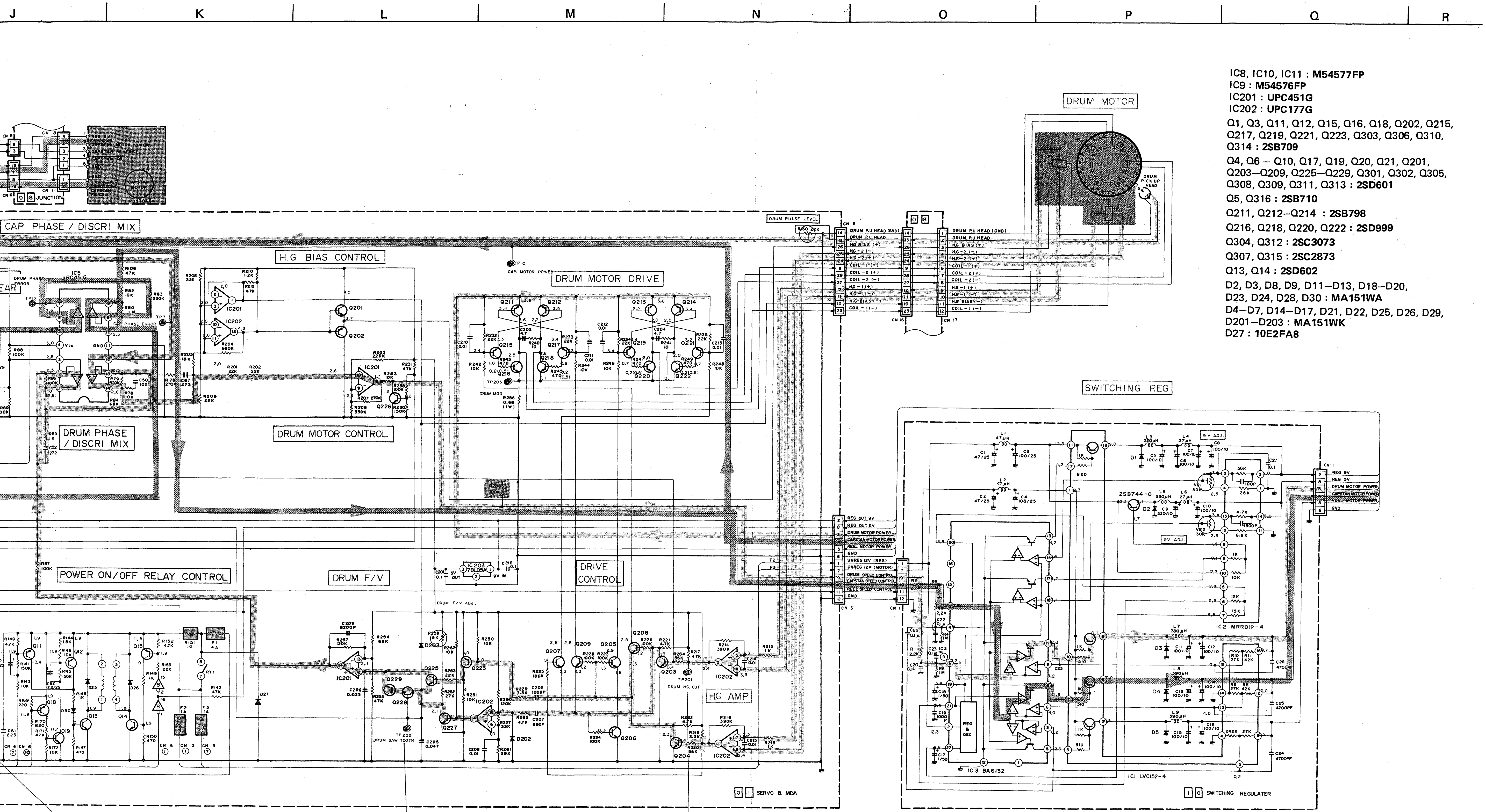
IC301	④	⑥	S2	S4	S1	S3
STOP	L	L	OFF	OFF	OFF	OFF
LOAD	L	H	OFF	ON	ON	OFF
UNLOAD	H	L	ON	OFF	OFF	ON
BRAKE	H	H	OFF	ON	OFF	ON

IC302	④	⑥	S2	S4	S1	S3
STOP	L	L	OFF	OFF	OFF	OFF
FWD	L	H	OFF	ON	ON	OFF
REV	H	L	ON	OFF	OFF	ON
BRAKE	H	H	OFF	ON	OFF	ON

ERVO & SW REG. SCHEMATIC
(MECHA. CON TIMING) 6-10

6-10 SERVO & SW REG. SCHEMATIC
(MECHA. CON TIMING)

SERVO & SW REG. SCHEMA
(MECHA. CON TIMI


J
K
L
M
N
O
P
Q
R
DRUM MOTOR
DRUM PICK UP HEAD
CAP PHASE / DISCRI MIX
H.G BIAS CONTROL
DRUM MOTOR DRIVE
DRUM PHASE / DISCRI MIX
DRUM MOTOR CONTROL
POWER ON/OFF RELAY CONTROL
DRUM F/V
DRIVE CONTROL
HG AMP
SWITCHING REG
DRUM PULSE LEVEL
PHASE ERROR
TP203
TP201
TP202
TP10
CAP. MOTOR POWER
DRUM F/V ADJ.
DRUM HG OUT
DRUM SAW TOOTH
9V ADJ.
5V ADJ.
IC2 MRR012-4
IC1 LVC152-4
IC3 BA6132
REG & OSC
O B JUNCTION
O I SERVO & MDA
I O SWITCHING REGULATER
CN 8
CN 16
CN 17
CN 3
CN 1
CN 2
DRUM P.U HEAD (GND)
DRUM P.U HEAD
HG BIAS (+)
COIL
REG OUT 9V
REG OUT 5V
DRUM MOTOR POWER
CAPSTAN MOTOR POWER
REEL MOTOR POWER
GND
UNREG 12V (REG)
UNREG 12V (MOTOR)
DRUM SPEED CONTROL
CAPSTAN SPEED CONTROL
REEL SPEED CONTROL
REG 9V
REG 5V
CAPSTAN MOTOR
PU33068V

IC8, IC10, IC11 : **M54577FP**
IC9 : **M54576FP**
IC201 : **UPC451G**
IC202 : **UPC177G**
Q1, Q3, Q11, Q12, Q15, Q16, Q18, Q202, Q215, Q217, Q219, Q221, Q223, Q303, Q306, Q310, Q314 : **2SB709**
Q4, Q6 – Q10, Q17, Q19, Q20, Q21, Q201, Q203–Q209, Q225–Q229, Q301, Q302, Q305, Q308, Q309, Q311, Q313 : **2SD601**
Q5, Q316 : **2SB710**
Q211, Q212–Q214 : **2SB798**
Q216, Q218, Q220, Q222 : **2SD999**
Q304, Q312 : **2SC3073**
Q307, Q315 : **2SC2873**
Q13, Q14 : **2SD602**
D2, D3, D8, D9, D11–D13, D18–D20, D23, D24, D28, D30 : **MA151WA**
D4–D7, D14–D17, D21, D22, D25, D26, D29, D201–D203 : **MA151WK**
D27 : **10E2FA8**

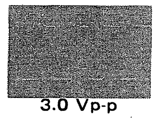
⑥	S2	S4	S1	S3
L	OFF	OFF	OFF	OFF
H	OFF	ON	ON	OFF
L	ON	OFF	OFF	ON
H	OFF	ON	OFF	ON

IC302	④	⑥	S2	S4	S1	S3
STOP	L	L	OFF	OFF	OFF	OFF
FWD	L	H	OFF	ON	ON	OFF
REV	H	L	ON	OFF	OFF	ON
BRAKE	H	H	OFF	ON	OFF	ON

TP-202
(DRUM SAW TOOTH)

1.6 Vp-p

TP-201
(DRUM H.G. OUT)

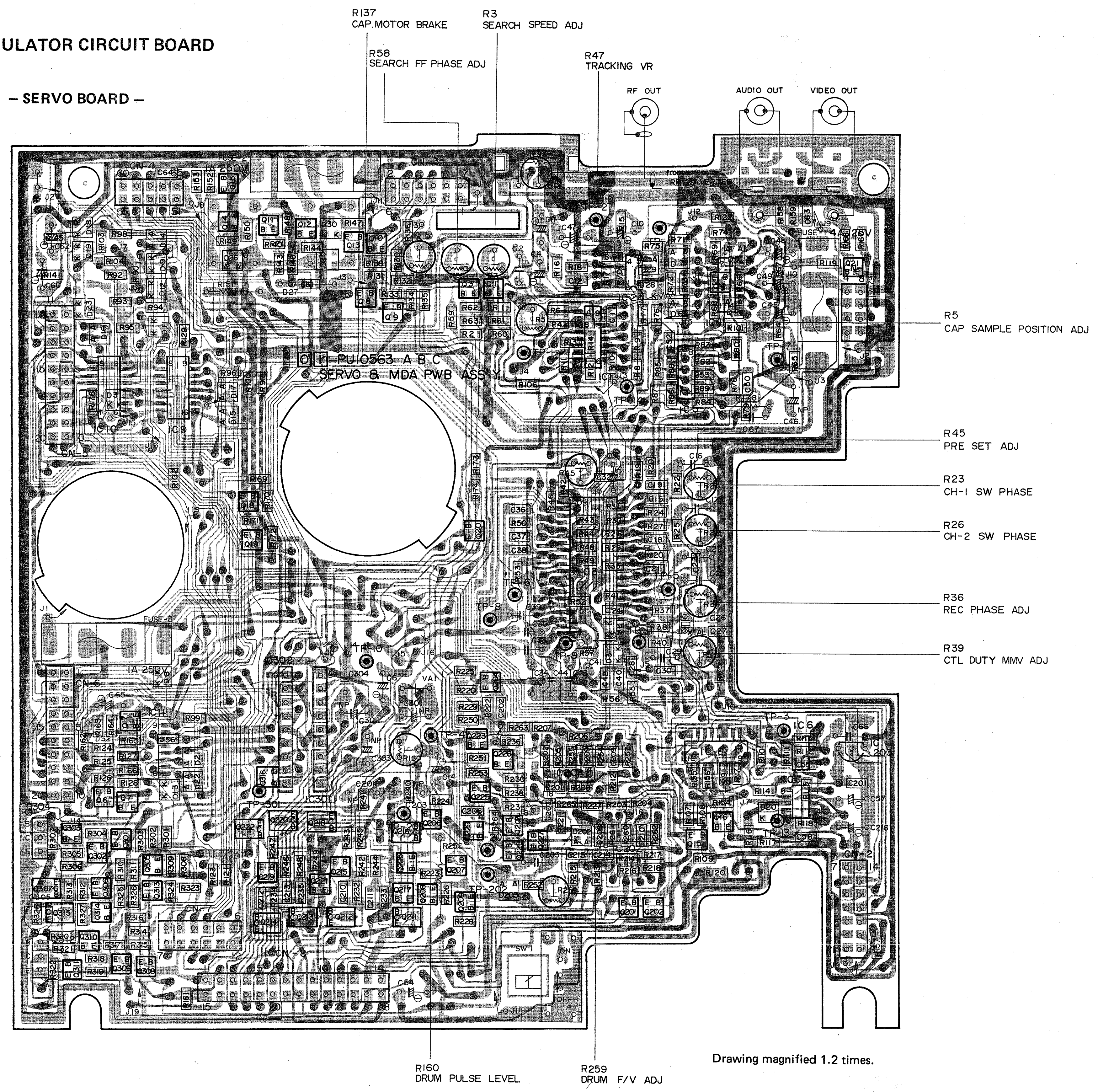


3.0 Vp-p

6-10 SERVO & SW REG. SCHEMATIC (MECHA. CON TIMING)

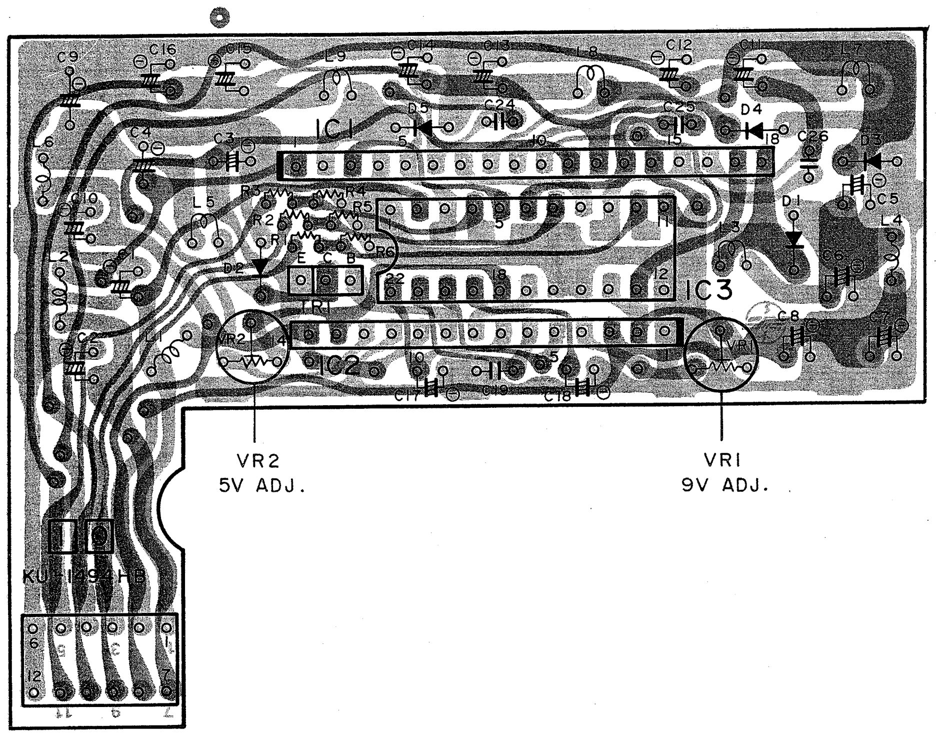
6.10 SERVO & SWITCHING REGULATOR CIRCUIT BOARD

– SERVO BOARD –


R137
CAP.MOTOR BRAKE
R3
SEARCH SPEED ADJ
R58
SEARCH FF PHASE ADJ
R47
TRACKING VR
RF OUT
AUDIO OUT
VIDEO OUT
R5
CAP SAMPLE POSITION ADJ
R45
PRE SET ADJ
R23
CH-1 SW PHASE
R26
CH-2 SW PHASE
R36
REC PHASE ADJ
R39
CTL DUTY MMV ADJ
R160
DRUM PULSE LEVEL
R259
DRUM F/V ADJ
PU10563 A B C
SERVO & MDA PWB ASS'Y
IC9
IC10
IC6
CN-2
CN-5
CN-6
CN-7
CN-8
SW1
FUSE-3
1A 250V
4A 125V
TP-8
TP-10
TP-3
TP-301

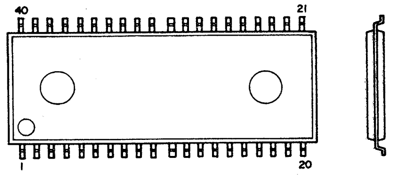
Drawing magnified 1.2 times.

– SWITCHING REGULATOR BOARD –

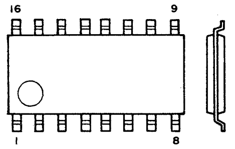

C9
C16
C15
C14
C13
C12
C11
L9
IC1
D5
C24
C25
D4
C26
D3
C4
C3
L6
L5
R3
R4
R5
R2
R1
R6
D2
E C B
TR1
IC3
D1
L4
C5
C8
IC2
C17
C19
C18
VR2
5V ADJ.
VR1
9V ADJ.
6
12
1
7

Drawing magnified 1.5 times.

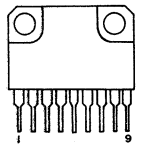
BAF851A



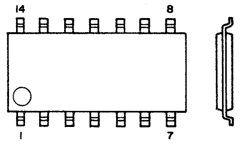
BAF6303



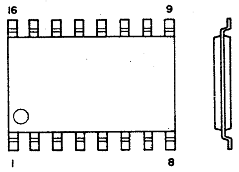
M54543L
M54545L



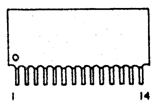
UPC451G
UPC177G



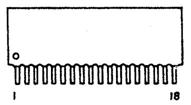
M54576FP
M54577FP



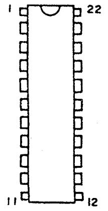
MRR011-4



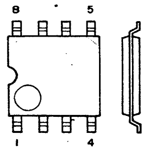
LVC152-4



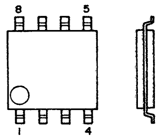
BA6132



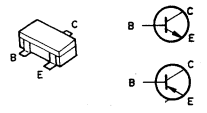
BAF6305
BAF225



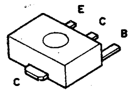
UPC1251G



2SB709 (Chip) ....AR
2SB710 (") ....CQ
2SD601 (Chip) ....YQ
2SD602 (") ....WR

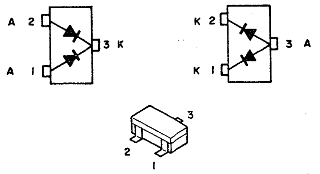


2SB798 (Chip) [POWER]..OL
2SC2873 (") [POWER]..MO
2SD999 (") [POWER]..CL

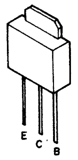


MA151WK (Chip)
......MT

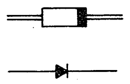
MA151WA (Chip)
......MN


A 2
3 K
A 1
K 2
3 A
K 1
3
2
1

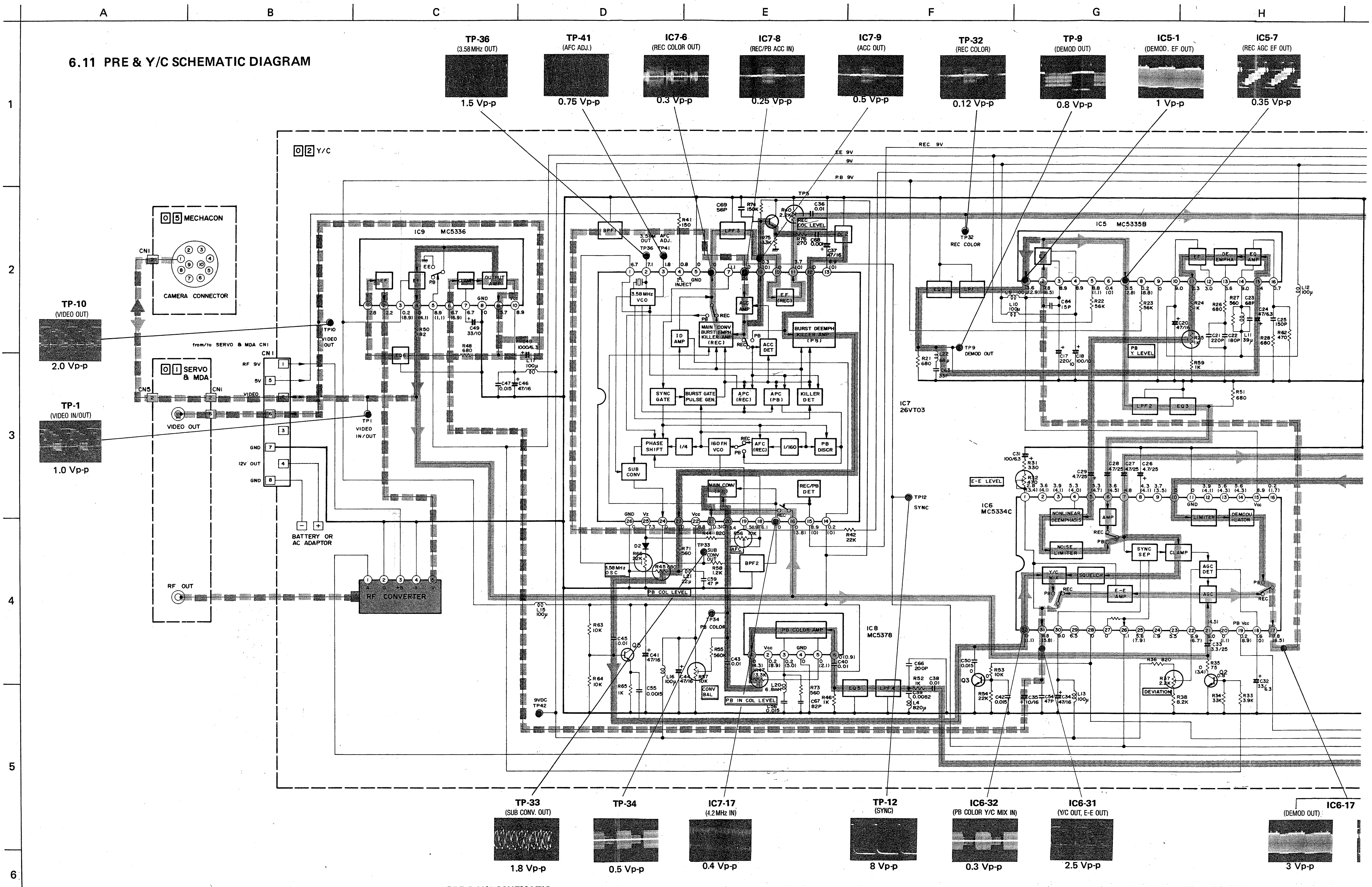
2SC3073



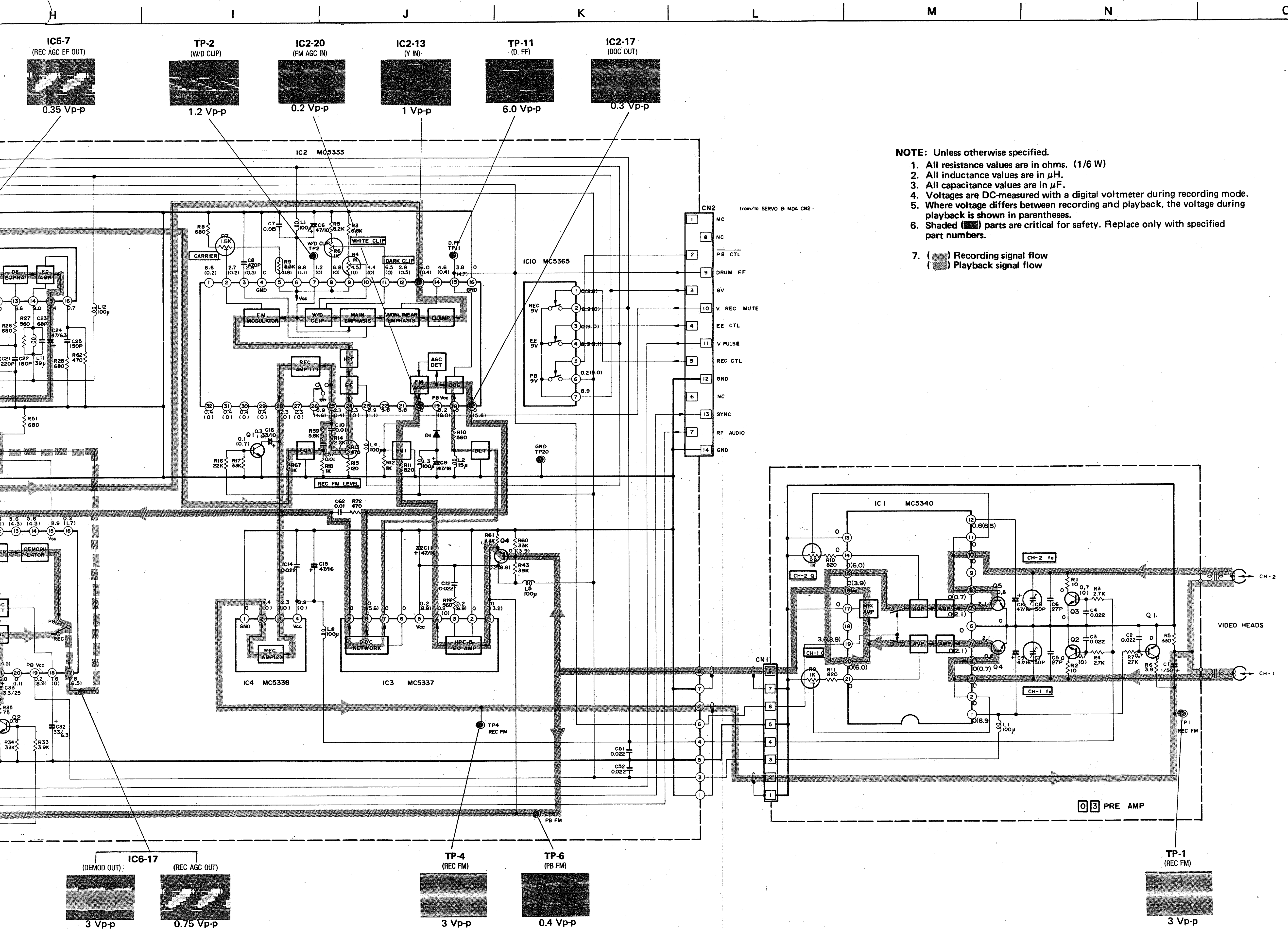
10E2FA8



6.11 PRE & Y/C SCHEMATIC DIAGRAM


A
B
C
D
E
F
G
H
1
2
3
4
5
6
TP-36
(3.58MHz OUT)
1.5 Vp-p
TP-41
(AFC ADJ.)
0.75 Vp-p
IC7-6
(REC COLOR OUT)
0.3 Vp-p
IC7-8
(REC/PB ACC IN)
0.25 Vp-p
IC7-9
(ACC OUT)
0.5 Vp-p
TP-32
(REC COLOR)
0.12 Vp-p
TP-9
(DEMOD OUT)
0.8 Vp-p
IC5-1
(DEMOD. EF OUT)
1 Vp-p
IC5-7
(REC AGC EF OUT)
0.35 Vp-p
TP-10
(VIDEO OUT)
2.0 Vp-p
TP-1
(VIDEO IN/OUT)
1.0 Vp-p
02 Y/C
05 MECHACON
CAMERA CONNECTOR
01 SERVO & MDA
VIDEO OUT
RF OUT
from/to SERVO & MDA CN1
CN1
CN5
RF 9V
5V
VIDEO
GND
12V OUT
BATTERY OR AC ADAPTOR
RF CONVERTER
IC9 MC5336
EF
CLAMP
OUTPUT AMP
EQ6
IC7 26VT03
3.58MHz VCO
MAIN CONV BURST EMPH KILLER AMP (REC)
BURST DEEMPH KILLER AMP (PB)
ACC AMP
ACC DET
ID AMP
SYNC GATE
BURST GATE PULSE GEN.
APC (REC)
APC (PB)
KILLER DET
PHASE SHIFT
1/4
160 fH VCO
AFC (REC)
1/160
PB DISCR
SUB CONV
MAIN CONV (PB)
REC/PB DET
3.58MHz OSC
BPF1
BPF2
LPF3
DL2
REC COL LEVEL
PB COL LEVEL
TP5
TP36
TP41
TP33 SUB CONV OUT
TP34 PB COLOR
9VDC TP42
IC8 MC5378
PB COLOR AMP
PB IN COL LEVEL
CONV BAL
EQ5
LPF4
IC5 MC5335B
EQ2
LPF1
DE EMPHA
EQ AMP
TP32 REC COLOR
TP9 DEMOD OUT
PB Y LEVEL
LPF2
EQ3
IC6 MC5334C
E-E LEVEL
NONLINEAR DEEMPHASIS
AMP
NOISE LIMITER
SYNC SEP
CLAMP
LIMITER
DEMODULATOR
AGC DET
AGC
Y/C MIX
SQUELCH
E-E AMP
DEVIATION
TP12 SYNC
REC 9V
EE 9V
9V
PB 9V
TP-33
(SUB CONV. OUT)
1.8 Vp-p
TP-34
0.5 Vp-p
IC7-17
(4.2MHz IN)
0.4 Vp-p
TP-12
(SYNC)
8 Vp-p
IC6-32
(PB COLOR Y/C MIX IN)
0.3 Vp-p
IC6-31
(Y/C OUT, E-E OUT)
2.5 Vp-p
IC6-17
(DEMOD OUT)
3 Vp-p

6-12 PRE & Y/C SCHEMATIC
(SERVO & SW REG. BOARD)


H
I
J
K
L
M
N
O
P
IC5-7
(REC AGC EF OUT)
0.35 Vp-p
TP-2
(W/D CLIP)
1.2 Vp-p
IC2-20
(FM AGC IN)
0.2 Vp-p
IC2-13
(Y IN)
1 Vp-p
TP-11
(D. FF)
6.0 Vp-p
IC2-17
(DOC OUT)
0.3 Vp-p
IC2 MC5333
CARRIER
WHITE CLIP
DARK CLIP
W/D CLIP TP2
D.FF TP11
DE EMPHA
EQ AMP
FM MODULATOR
W/D CLIP
MAIN EMPHASIS
NONLINEAR EMPHASIS
CLAMP
REC AMP (1)
HPF
EF
AGC DET
FM AGC
DOC
EQ4
EQ1
DL1
REC FM LEVEL
GND TP20
IC10 MC5365
REC 9V
EE 9V
PB 9V
CN2
from/to SERVO & MDA CN2
NC
NC
PB CTL
DRUM FF
9V
V. REC MUTE
EE CTL
V PULSE
REC CTL
GND
NC
SYNC
RF AUDIO
GND
DEMODU LATOR
IC4 MC5338
REC AMP(2)
IC3 MC5337
DOC NETWORK
HPF & EQ AMP
TP4 REC FM
TP6 PB FM
CN1
IC1 MC5340
MIX AMP
AMP
CH-2 Q
CH-1 Q
CH-2 fo
CH-1 fo
VIDEO HEADS
CH-2
CH-1
TP1 REC FM
03 PRE AMP
IC6-17
(DEMOD OUT)
3 Vp-p
(REC AGC OUT)
0.75 Vp-p
TP-4
(REC FM)
3 Vp-p
TP-6
(PB FM)
0.4 Vp-p
TP-1
(REC FM)
3 Vp-p

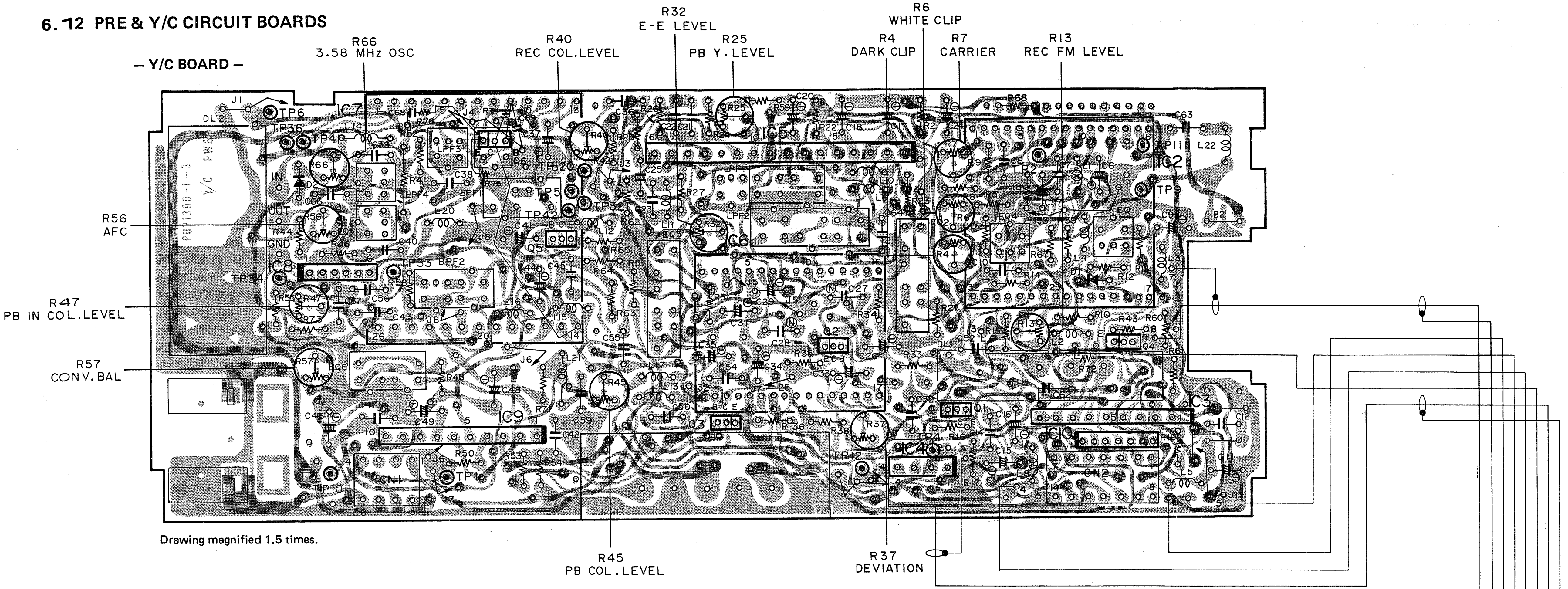
NOTE: Unless otherwise specified.

1. All resistance values are in ohms. (1/6 W)
2. All inductance values are in μH.
3. All capacitance values are in μF.
4. Voltages are DC-measured with a digital voltmeter during recording mode.
5. Where voltage differs between recording and playback, the voltage during playback is shown in parentheses.
6. Shaded (▨) parts are critical for safety. Replace only with specified part numbers.

7. (▨) Recording signal flow
   (▨) Playback signal flow

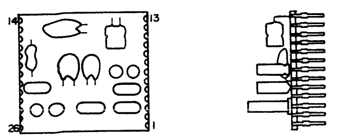
6.12 PRE & Y/C CIRCUIT BOARDS

– Y/C BOARD –

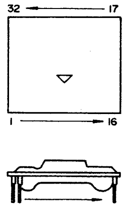

R66
3.58 MHz OSC
R40
REC COL.LEVEL
R32
E-E LEVEL
R25
PB Y.LEVEL
R6
WHITE CLIP
R4
DARK CLIP
R7
CARRIER
R13
REC FM LEVEL
R56
AFC
R47
PB IN COL.LEVEL
R57
CONV.BAL
R45
PB COL.LEVEL
R37
DEVIATION
IC7
IC8
IC9
IC5
IC6
IC4
IC3
IC2
IC10
CN1
CN2
TP6
TP36
TP4
TP34
TP1
TP10
TP12
TP11
TP9
PU11390-1-3 Y/C PWB

Drawing magnified 1.5 times.

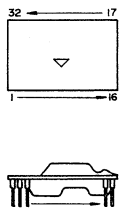
26VT03



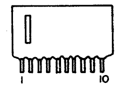
MC5333



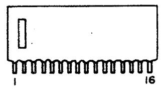
MC5334C



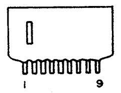
MC5336



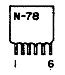
MC5335B



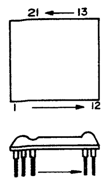
MC5337



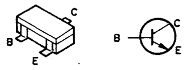
MC5378



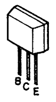
MC5340



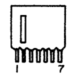
2SD602R (Chip)......... WR
2SC2716Y (")........ FY



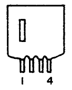
2SC2787LF or KF



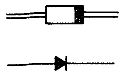
MC5365



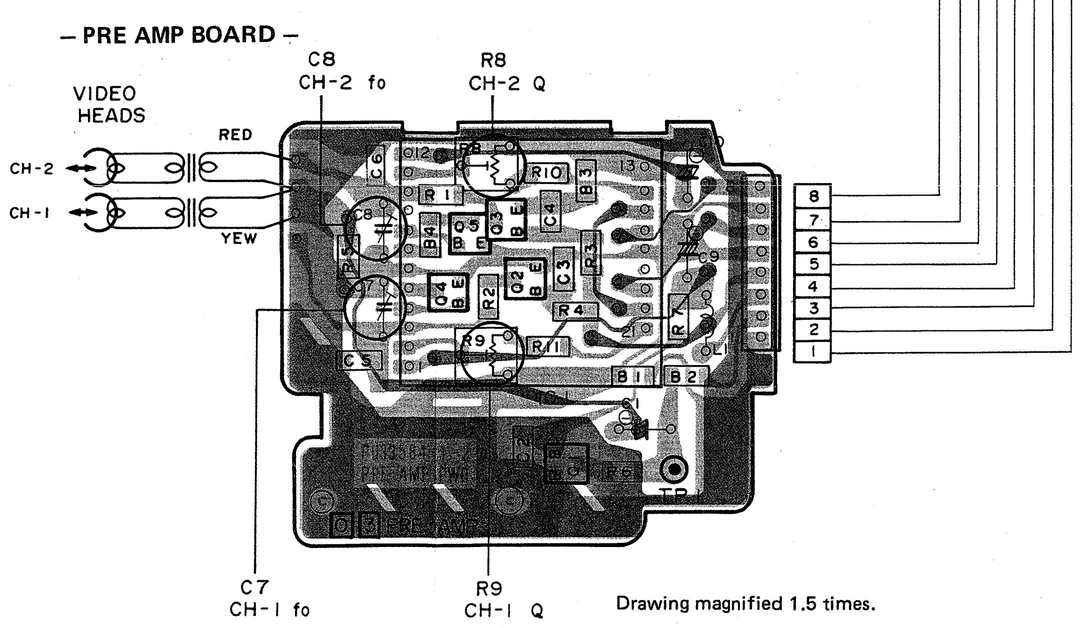
MC5338



1SS133

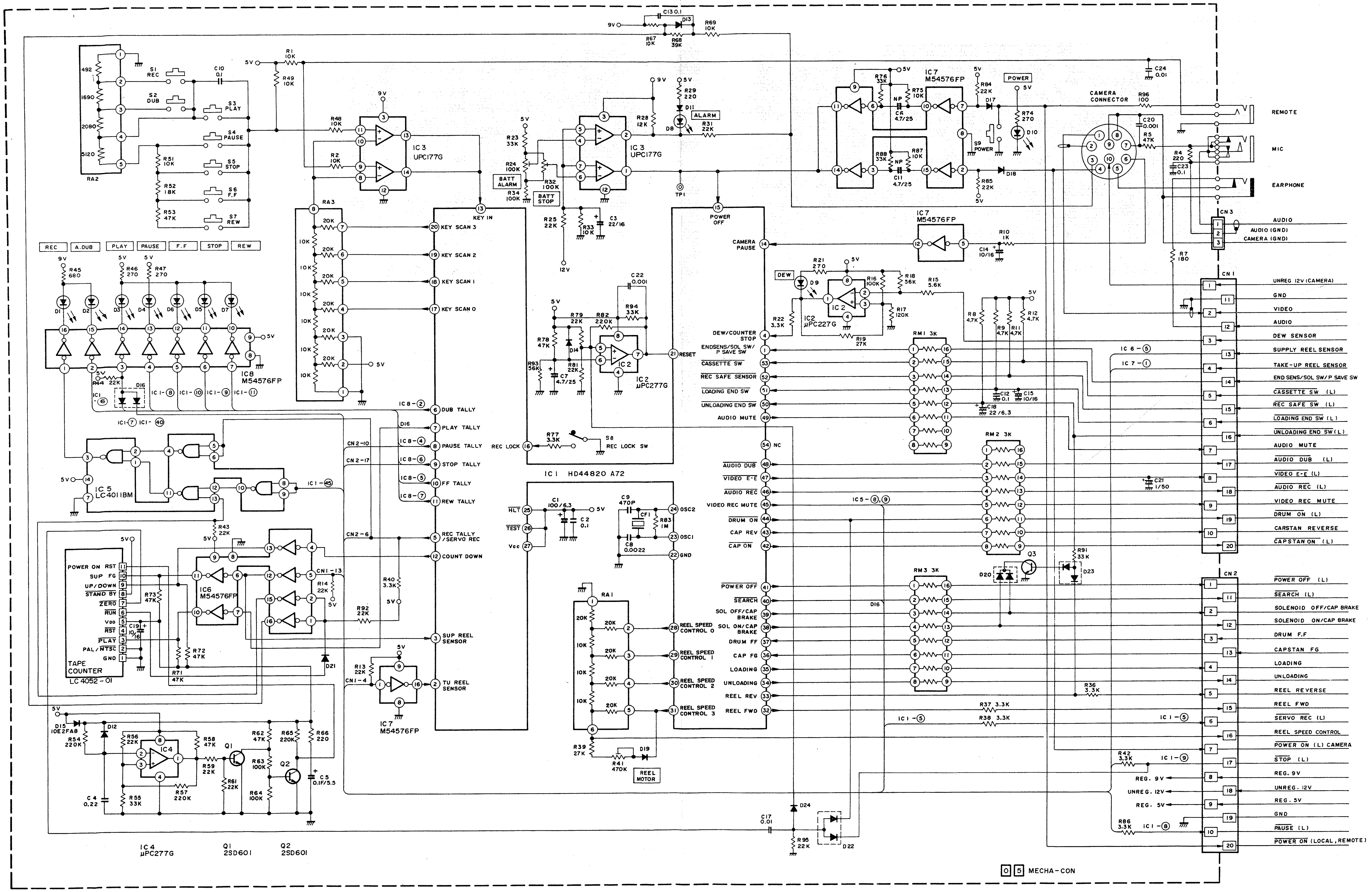


– PRE AMP BOARD –

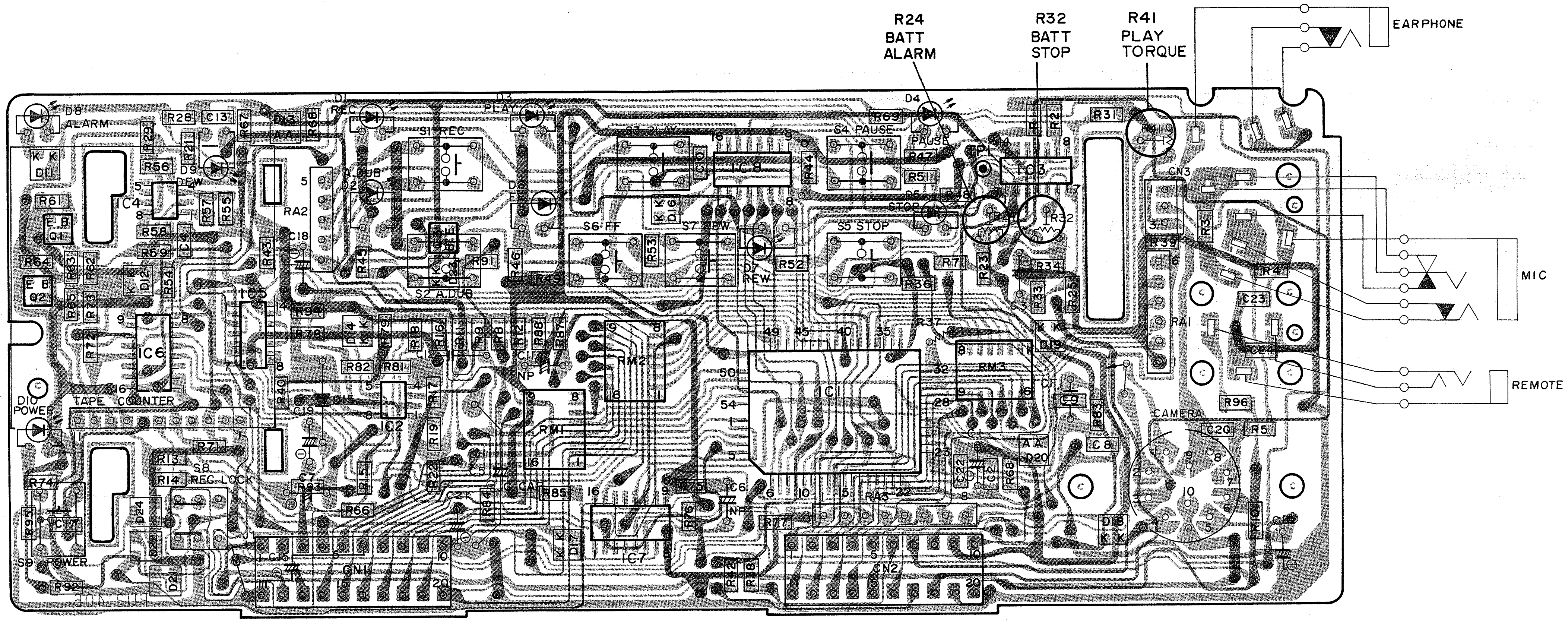

C8
CH-2 fo
R8
CH-2 Q
VIDEO
HEADS
RED
YEW
CH-2
CH-1
C7
CH-1 fo
R9
CH-1 Q
8
7
6
5
4
3
2
1
TP1
PRE-AMP PWB

Drawing magnified 1.5 times.

6.13 MECHANISM CONTROL SCHEMATIC DIAGRAM

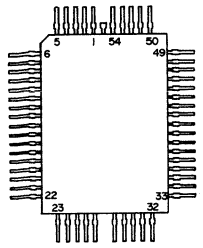

RA2
S1 REC
S2 DUB
S3 PLAY
S4 PAUSE
S5 STOP
S6 F.F
S7 REW
C10 0.1
R1 10K
R49 10K
R51 10K
R52 18K
R53 47K
REC
A.DUB
PLAY
PAUSE
F.F
STOP
REW
R45 680
R46 270
R47 270
D1
D2
D3
D4
D5
D6
D7
IC8 M54576FP
R44 22K
D16
IC5 LC4011BM
R43 22K
POWER ON RST
SUP FG
UP/DOWN
STAND BY
ZERO
RUN
Vdd
RST
PLAY
PAL/NTSC
GND
TAPE COUNTER
LC4052-01
IC6 M54576FP
R73 47K
R72 47K
R71 47K
C19 10/16
R14 22K
R92 22K
R40 3.3K
R13 22K
IC7 M54576FP
D21
D15 10E2FA8
D12
R54 220K
R56 22K
R58 47K
IC4
R59 22K
R55 33K
R57 220K
C4 0.22
Q1
Q2
R62 47K
R63 100K
R64 100K
R61 22K
R65 220K
R66 220
C5 0.1F/5.5
IC4 μPC277G
Q1 2SD601
Q2 2SD601
R48 10K
R2 10K
IC3 UPC177G
RA3
KEY IN
KEY SCAN 3
KEY SCAN 2
KEY SCAN 1
KEY SCAN 0
DUB TALLY
PLAY TALLY
PAUSE TALLY
STOP TALLY
FF TALLY
REW TALLY
REC TALLY /SERVO REC
COUNT DOWN
SUP REEL SENSOR
TU REEL SENSOR
REC LOCK
R77 3.3K
S8 REC LOCK SW
IC1 HD44820 A72
HLT
TEST
Vcc
C1 100/6.3
C2 0.1
C9 470P
CF1
R83 1M
C8 0.0022
OSC2
OSC1
GND
RA1
REEL SPEED CONTROL 0
REEL SPEED CONTROL 1
REEL SPEED CONTROL 2
REEL SPEED CONTROL 3
R39 27K
R41 470K
D19
REEL MOTOR
9V
C13 0.1
D13
R69 10K
R67 10K
R68 39K
R23 33K
R24 100K
BATT ALARM
R32 100K
R34 100K
BATT STOP
R25 22K
R33 10K
C3 22/16
R28 12K
R29 220
D11
ALARM
D8
R31 22K
TP1
C22 0.001
R94 33K
R79 22K
R82 220K
R78 47K
D14
R93 56K
R81 22K
C7 4.7/25
IC2 μPC277G
RESET
POWER OFF
CAMERA PAUSE
DEW/COUNTER STOP
ENDSENS/SOL SW/ P SAVE SW
CASSETTE SW
REC SAFE SENSOR
LOADING END SW
UNLOADING END SW
AUDIO MUTE
NC
AUDIO DUB
VIDEO E-E
AUDIO REC
VIDEO REC MUTE
DRUM ON
CAP REV
CAP ON
POWER OFF
SEARCH
SOL OFF/CAP BRAKE
SOL ON/CAP BRAKE
DRUM FF
CAP FG
LOADING
UNLOADING
REEL REV
REEL FWD
C17 0.01
D24
R95 22K
D22
IC7 M54576FP
R76 33K
R75 10K
C6 4.7/25
R88 33K
R87 10K
C11 4.7/25
R84 22K
D17
S9 POWER
POWER
R74 270
D10
D18
R85 22K
R10 1K
C14 10/16
DEW
D9
R21 270
R22 3.3K
R16 100K
R18 56K
R15 5.6K
R17 120K
R19 27K
RM1 3K
RM2 3K
RM3 3K
R8 4.7K
R9 4.7K
R11 4.7K
R12 4.7K
C12 0.1
C15 10/16
C18 22/6.3
C21 1/50
IC6-⑤
IC7-①
IC5-⑧,⑨
R91 33K
Q3
D20
D23
R36 3.3K
R37 3.3K
R38 3.3K
IC1-⑤
R42 3.3K
IC1-⑨
REG. 9V
UNREG. 12V
REG. 5V
R86 3.3K
IC1-⑧
C24 0.01
CAMERA CONNECTOR
R96 100
C20 0.001
R5 47K
R4 220
C23 0.1
R7 180
CN3
REMOTE
MIC
EARPHONE
AUDIO
AUDIO (GND)
CAMERA (GND)
CN1
UNREG 12V (CAMERA)
GND
VIDEO
AUDIO
DEW SENSOR
SUPPLY REEL SENSOR
TAKE-UP REEL SENSOR
END SENS/SOL SW/P SAVE SW
CASSETTE SW (L)
REC SAFE SW (L)
LOADING END SW (L)
UNLOADING END SW (L)
AUDIO MUTE
AUDIO DUB (L)
VIDEO E-E (L)
AUDIO REC (L)
VIDEO REC MUTE
DRUM ON (L)
CARSTAN REVERSE
CAPSTAN ON (L)
CN2
POWER OFF (L)
SEARCH (L)
SOLENOID OFF/CAP BRAKE
SOLENOID ON/CAP BRAKE
DRUM F.F
CAPSTAN FG
LOADING
UNLOADING
REEL REVERSE
REEL FWD
SERVO REC (L)
REEL SPEED CONTROL
POWER ON (L) CAMERA
STOP (L)
REG. 9V
UNREG. 12V
REG. 5V
GND
PAUSE (L)
POWER ON (LOCAL, REMOTE)
0 5 MECHA-CON

6. 14 MECHANISM CONTORL CIRCUIT BOARD

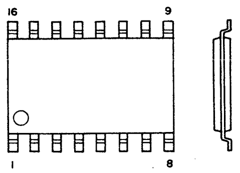

R24
BATT
ALARM
R32
BATT
STOP
R41
PLAY
TORQUE
EARPHONE
MIC
REMOTE
D8 ALARM
D1 REC
D3 PLAY
D4
PAUSE
D5
STOP
D9
REW
D2 A.DUB
D6 FF
D7 REW
D10 POWER
S1 REC
S2 A.DUB
S3 PLAY
S4 PAUSE
S5 STOP
S6 FF
S7 REW
S8 REC LOCK
S9 POWER
TAPE COUNTER
CAMERA
IC1
IC2
IC3
IC4
IC5
IC6
IC7
IC8
RM1
RM2
RM3
RA1
RA2
RA3
CN1
CN2
CN3
Q1
Q2

Drawing magnified 1.5 times.

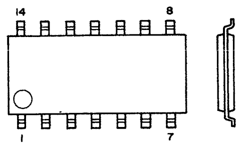
HK44820A72


5
1
54
50
6
49
22
33
23
32

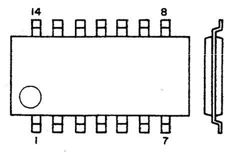
M54576FP



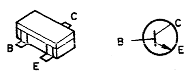
UPC177G



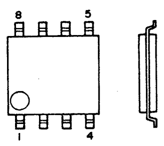
LC4011BM



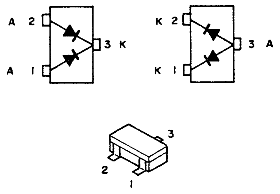
2SD601QRS (Chip) ....YQ



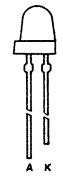
UPC277G



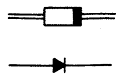
MA151WK **MA151WA**


A 2
A 1
3 K
K 2
K 1
3 A
3
2
1

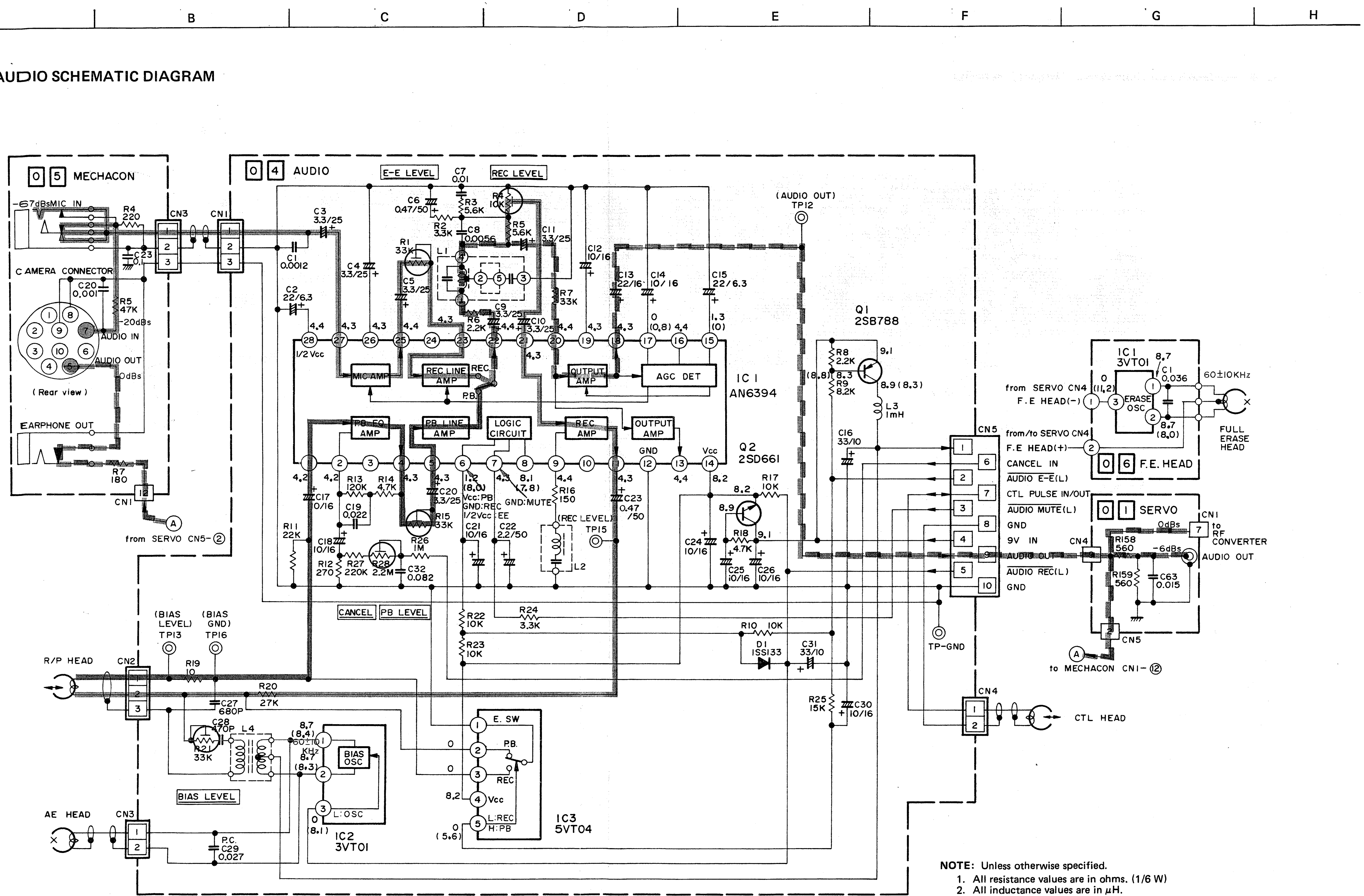
TLUR143-DE



10E2FA8



6.15 AUDIO SCHEMATIC DIAGRAM

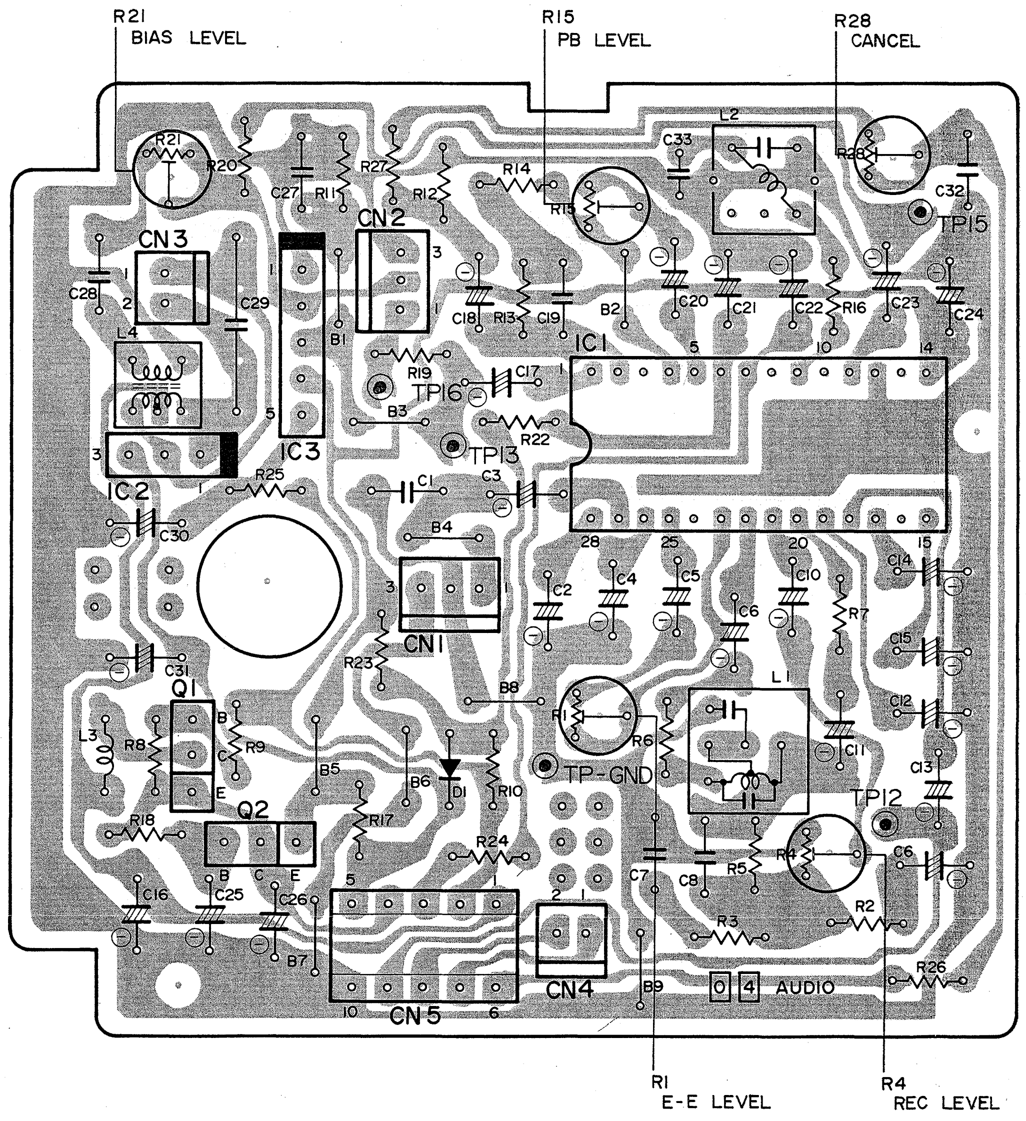

A
B
C
D
E
F
G
H
1
2
3
4
5
6
05 MECHACON
-67dBsMIC IN
R4 220
CN3
CN1
C23 0.1
CAMERA CONNECTOR
C20 0.001
R5 47K
-20dBs
AUDIO IN
AUDIO OUT
0dBs
(Rear view)
EARPHONE OUT
R7 180
CN1
12
A
from SERVO CN5-②
04 AUDIO
E-E LEVEL
C7 0.01
REC LEVEL
C3 3.3/25
C1 0.0012
C2 22/6.3
C4 33/25
C6 0.47/50
R2 3.3K
R3 5.6K
C8 0.0056
R4 10K
R5 5.6K
C11 3.3/25
R1 33K
L1
C5 3.3/25
R6 2.2K
C9 3.3/25
C10 3.3/25
R7 33K
C12 10/16
C13 22/16
C14 10/16
C15 22/6.3
1/2 Vcc
MIC AMP
REC LINE AMP
REC
P.B.
OUTPUT AMP
AGC DET
IC1 AN6394
PB EQ AMP
PB LINE AMP
LOGIC CIRCUIT
REC AMP
OUTPUT AMP
GND
Vcc
(AUDIO OUT) TP12
Q1 2SB788
R8 2.2K
R9 8.2K
L3 1mH
C16 33/10
Q2 2SD661
R17 10K
R18 4.7K
C24 10/16
C25 10/16
C26 10/16
C17 10/16
R11 22K
R13 120K
R14 4.7K
C19 0.022
C18 10/16
R12 270
R27 220K
R28 2.2M
R26 1M
C32 0.082
C20 3.3/25
R15 33K
Vcc:PB GND:REC 1/2Vcc:EE
GND:MUTE
R16 150
(REC LEVEL) TP15
C21 10/16
C22 2.2/50
L2
C23 0.47/50
CANCEL
PB LEVEL
R22 10K
R23 10K
R24 3.3K
R10 10K
D1 1SS133
C31 33/10
R25 15K
C30 10/16
TP-GND
(BIAS LEVEL) TP13
(BIAS GND) TP16
R/P HEAD
CN2
R19 10
R20 27K
C27 680P
C28 470P
L4
R21 33K
BIAS OSC
L:OSC
IC2 3VT01
BIAS LEVEL
E. SW
P.B.
REC
Vcc
L:REC H:PB
IC3 5VT04
AE HEAD
P.C. C29 0.027
CN5
from SERVO CN4
F.E HEAD(-)
from/to SERVO CN4
F.E HEAD(+)
CANCEL IN
AUDIO E-E(L)
CTL PULSE IN/OUT
AUDIO MUTE(L)
GND
9V IN
AUDIO OUT
AUDIO REC(L)
GND
IC1 3VT01
ERASE OSC
C1 0.036
60±10KHz
FULL ERASE HEAD
06 F.E. HEAD
01 SERVO
CN1
to RF CONVERTER
0dBs
CN4
R158 560
-6dBs
AUDIO OUT
R159 560
C63 0.015
CN5
A
to MECHACON CN1-⑫
CN4
CTL HEAD

NOTE: Unless otherwise specified.

1. All resistance values are in ohms. (1/6 W)
2. All inductance values are in μH.
3. All capacitance values are in μF.
4. Voltages are DC-measured with a digital voltmeter during recording mode.
5. Where voltage differs between recording and playback, the voltage during playback is shown in parentheses.
6. Shaded (▨) parts are critical for safety. Replace only with specified part numbers.
7. (▨) Recording signal flow
   (▨) Playback signal flow

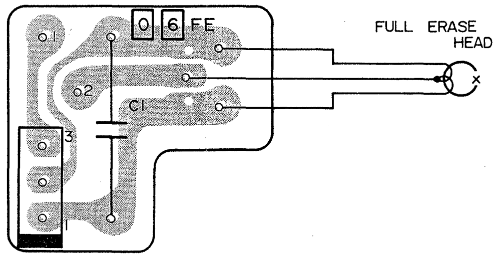
6. 16 AUDIO CIRCUIT BOARD

– AUDIO CIRCUIT BOARD –


R21
BIAS LEVEL
R15
PB LEVEL
R28
CANCEL
R21
R20
C27
R11
R27
R12
R14
R15
C33
L2
R28
C32
TP15
CN3
CN2
C28
L4
C29
B1
C18
R13
C19
B2
C20
C21
C22
R16
C23
C24
IC1
R19
TP16
C17
B3
R22
TP13
IC3
IC2
R25
C1
C3
C30
B4
CN1
28
C4
25
C5
C2
20
C10
15
C14
C6
R7
C15
R23
B8
C31
Q1
L1
C12
R1
C11
C13
L3
R8
R9
B5
R6
B6
D1
R10
TP-GND
TP12
R18
Q2
R17
R24
C7
C8
R5
R4
C6
C16
C25
C26
B7
R3
R2
R26
CN4
B9
04 AUDIO
CN5
R1
E-E LEVEL
R4
REC LEVEL

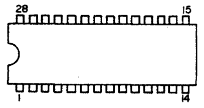
Drawing magnified 2 times.

– FULL ERASE HEAD BOARD –

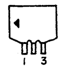

06 FE
FULL ERASE HEAD
C1
1
2
3

Drawing magnified 2 times.

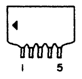
AN6394



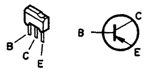
3VT01



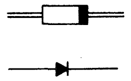
5VT04



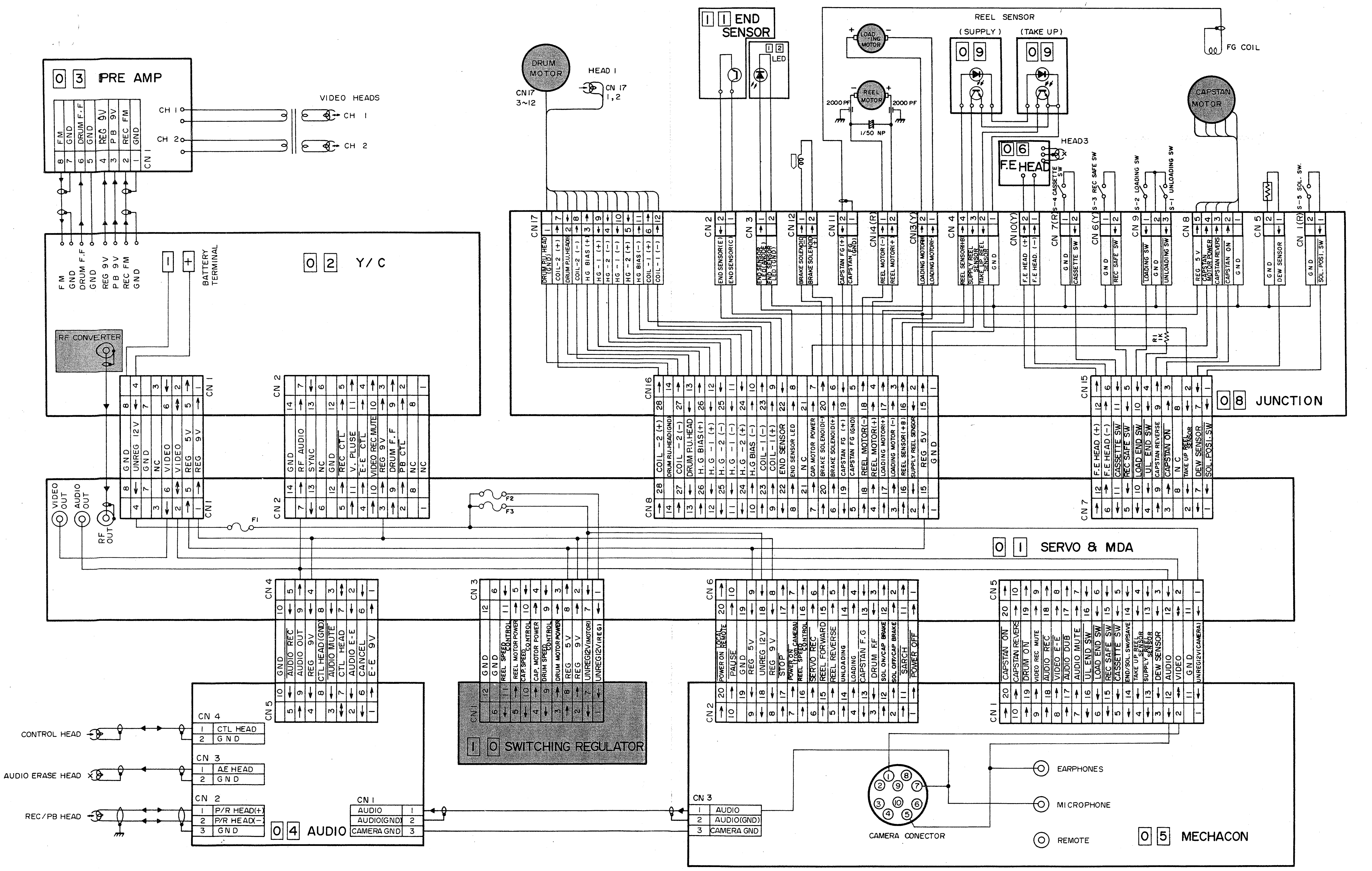
2SB788STU
2SB661STU



1SS133



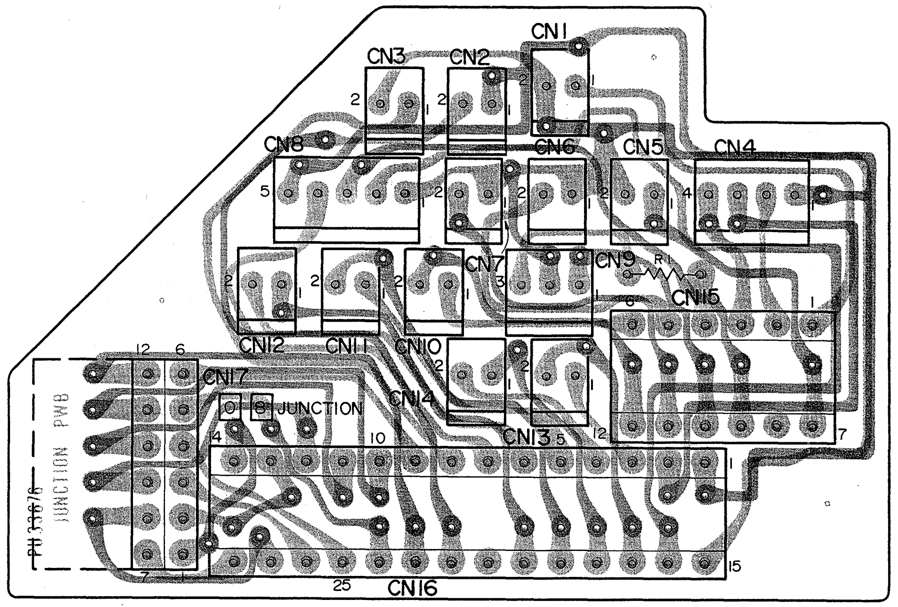
6.17 OVERALL WIRING DIAGRAM



03 PRE AMP
VIDEO HEADS
CH 1
CH 2
02 Y/C
BATTERY TERMINAL
RF CONVERTER
VIDEO OUT
AUDIO OUT
RF OUT
DRUM MOTOR
HEAD 1
CN 17 3~12
CN 17 1, 2
11 END SENSOR
12 LED
LOADING MOTOR
REEL MOTOR
2000 PF
1/50 NP
REEL SENSOR (SUPPLY) (TAKE UP)
09
FG COIL
CAPSTAN MOTOR
06 F.E HEAD
HEAD3
S-4 CASSETTE SW
S-3 REC SAFE SW
S-2 LOADING SW
S-1 UNLOADING SW
S-5 SOL. SW.
08 JUNCTION
01 SERVO & MDA
F1
F2
F3
CN 16
CN 8
CN 15
CN 7
CN 4
CN 3
CN 6
CN 5
10 SWITCHING REGULATOR
04 AUDIO
CONTROL HEAD
AUDIO ERASE HEAD
REC/PB HEAD
CTL HEAD
AE HEAD
P/R HEAD(+)
P/R HEAD(−)
AUDIO
AUDIO(GND)
CAMERA GND
CAMERA CONECTOR
EARPHONES
MICROPHONE
REMOTE
05 MECHACON

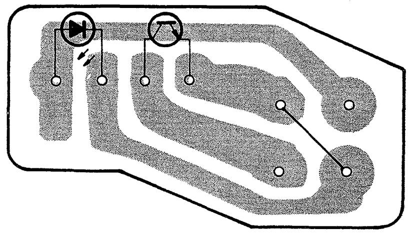
6. 18 JUNCTION AND SENSOR CIRCUIT BOARDS

– JUNCTION BOARD –

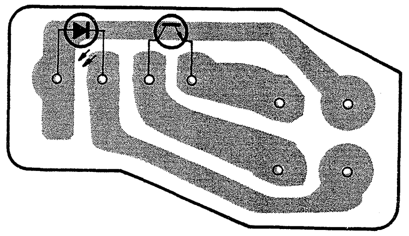

CN1
CN2
CN3
CN4
CN5
CN6
CN7
CN8
CN9
CN10
CN11
CN12
CN13
CN14
CN15
CN16
CN17
JUNCTION
JUNCTION PWB

Drawing magnified 2 times.

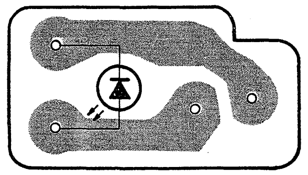
– TAKE-UP REEL SENSOR BOARD –



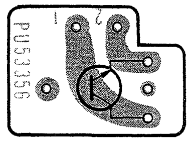
–SUPPLY REEL SENSOR BOARD –



– LED BOARD –

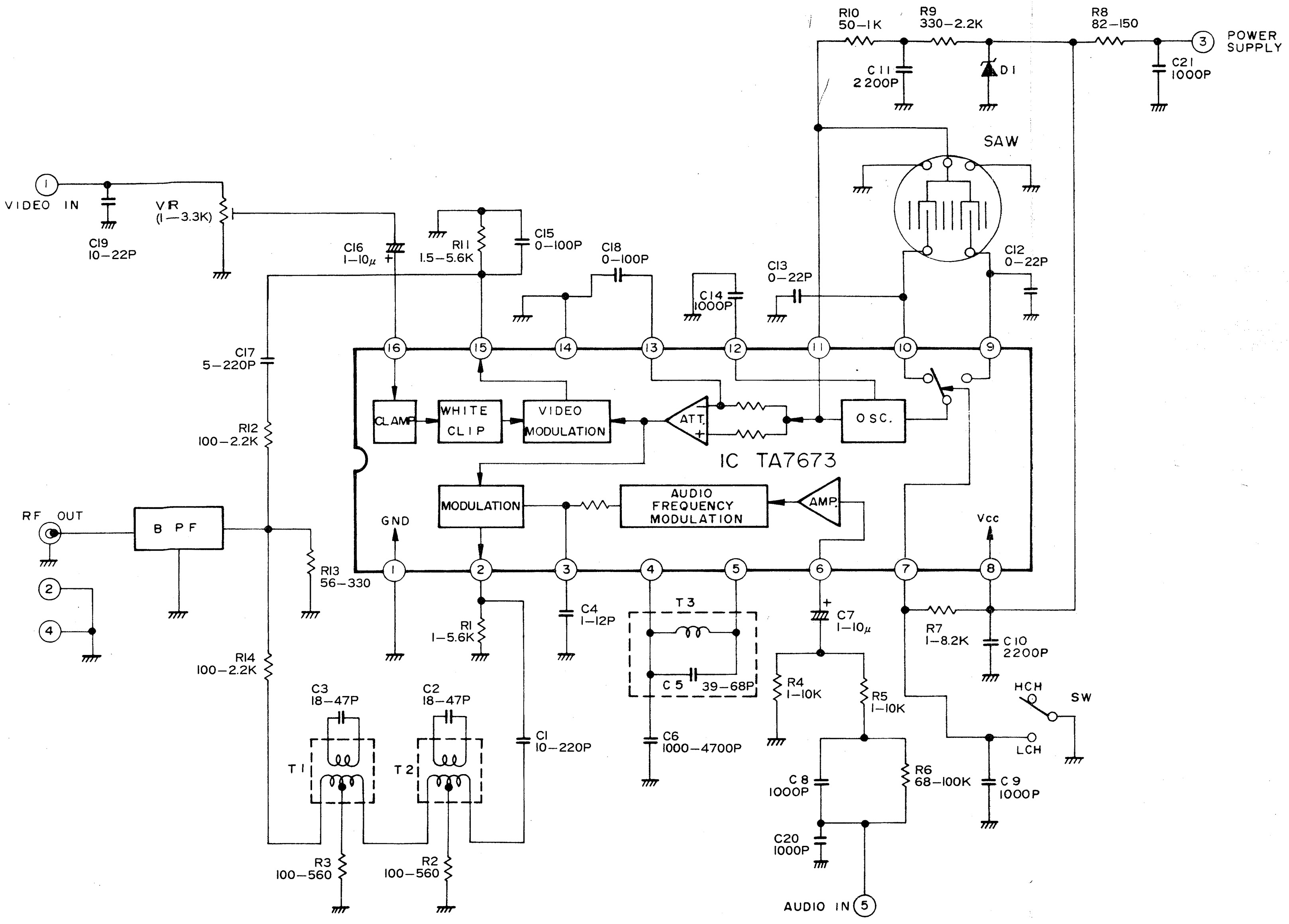


– END SENSOR BOARD –



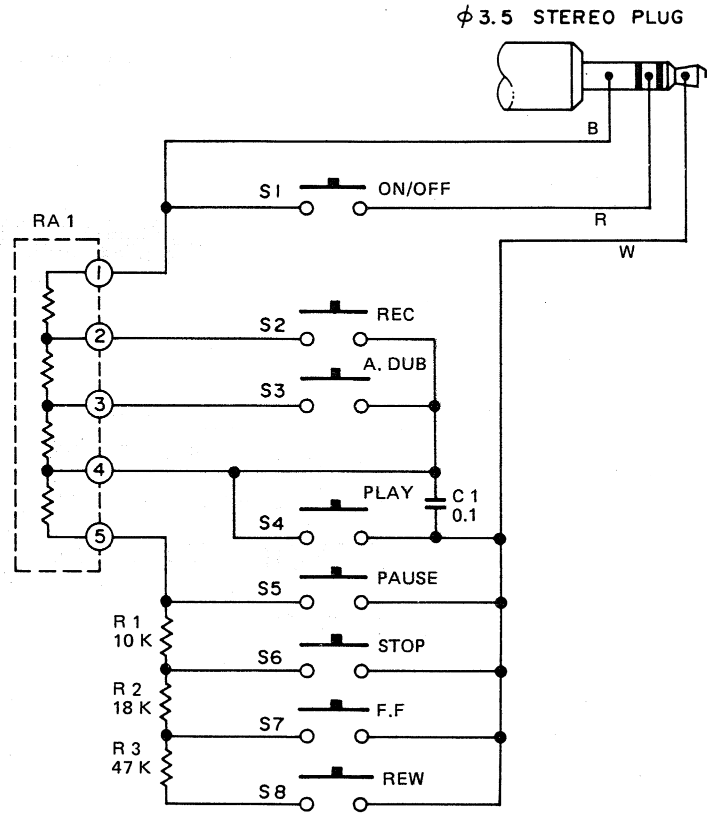
Drawing magnified 1.5 times.

6.19 RF CONVERTER SCHEMATIC DIAGRAM


R10
50–1K
R9
330–2.2K
R8
82–150
③ POWER SUPPLY
C11
2200P
D1
C21
1000P
SAW
① VIDEO IN
C19
10–22P
VR
(1–3.3K)
C16
1–10μ
R11
1.5–5.6K
C15
0–100P
C18
0–100P
C14
1000P
C13
0–22P
C12
0–22P
C17
5–220P
R12
100–2.2K
16
15
14
13
12
11
10
9
CLAMP
WHITE CLIP
VIDEO MODULATION
ATT.
OSC.
IC TA7673
MODULATION
AUDIO FREQUENCY MODULATION
AMP.
GND
Vcc
1
2
3
4
5
6
7
8
RF OUT
B P F
②
④
R13
56–330
R1
1–5.6K
C4
1–12P
T3
C5 39–68P
C6
1000–4700P
C7
1–10μ
R7
1–8.2K
C10
2200P
R14
100–2.2K
C3
18–47P
C2
18–47P
T1
T2
C1
10–220P
R4
1–10K
R5
1–10K
HCH
SW
LCH
C8
1000P
R6
68–100K
C9
1000P
C20
1000P
R3
100–560
R2
100–560
AUDIO IN ⑤

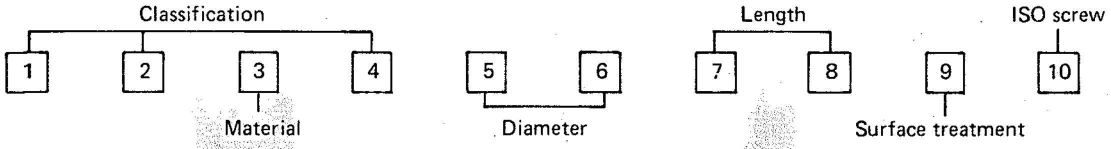
IC : TA7673
SAW : F1382 OR EQUIVALENT
D1 : MTZ6.2 OR HZS6C OR EQUIVALENT
All RESISTANCE VALUES : OHM
All CAPACITANCE VALUES : F

6.20 RM-P3U REMOTE CONTROL UNIT SCHEMATIC DIAGRAM


ϕ3.5 STEREO PLUG
B
R
W
RA 1
1
2
3
4
5
S1
ON/OFF
S2
REC
A. DUB
S3
PLAY
C 1
0.1
S4
S5
PAUSE
R 1
10 K
S6
STOP
R 2
18 K
S7
F.F
R 3
47 K
S8
REW

SECTION 7
EXPLODED VIEWS AND PARTS LIST

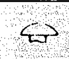
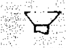
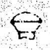
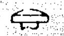
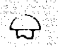
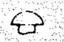
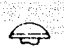
7.1 SCREW CODING



Classification (first digit)

Symbol Letter	Name
S	Normal screw
N	Assembly screw
L	"
D	"
M	Wood screw
F	Feather screw
T	Set screw
Y	"
B	Bolt
N	Nut
W	Washer
R	E-ring
E	Eyelet
P	Spring
G	Washer head screw

Shape of Screw Head (second digit)

Symbol Letter		Shape of Screw Head
P		Pan head
S		Flat countersunk head
H		Oval countersunk head
D		Binding head
R		Round head
B		Round head
T		Truss head

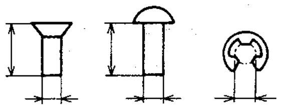
Material (third digit)

Symbol Letter	Material
S	Steel
E	Stainless steel
C	Cast iron
U	Bronze
B	Brass
P	Phosphor bronze
N	German silver
Y	Brass
A	Aluminum
Z	Zinc alloy
K	Polycarbonate

Type of Screw (fourth digit)

Symbol Letter	Type of Screw
P	Cross-Recessed head screw
A	Tapping screw
B	Special tapping screw
T	Special tapping screw
E	Special tapping screw
F	Special tapping screw

Diameter and Length of Screw (fifth – eighth digit)



– Example –

S P B P 3 0 0 6 Z S

(Diameter x 10) (Length)

Diameter : 3 mm
Length : 6 mm

Surface Treatment (ninth digit)

Symbol Letter	Surface Treatment
Z	Galvanization, dichromic acid treatment (MFZn2-C)
N	Nickel plating (MFNi2, MFNil)
R	Chrome plating (MBCr2, MBCr1)
G	Silver plating (SP4)
W	Nichrome platings
P	Phosphite treatment
B	Bronze plating

Symbol letter	Surface treatment
M	Black coloring after galvanization
A	Red coloring after galvanization
C	Blue coloring after galvanization
T	Green coloring after galvanization
V	Violet coloring after galvanization
F	Iron with black coloring

.2 LAYOUT OF MAIN MECHANICAL PARTS

.2.1 Top view and parts identification

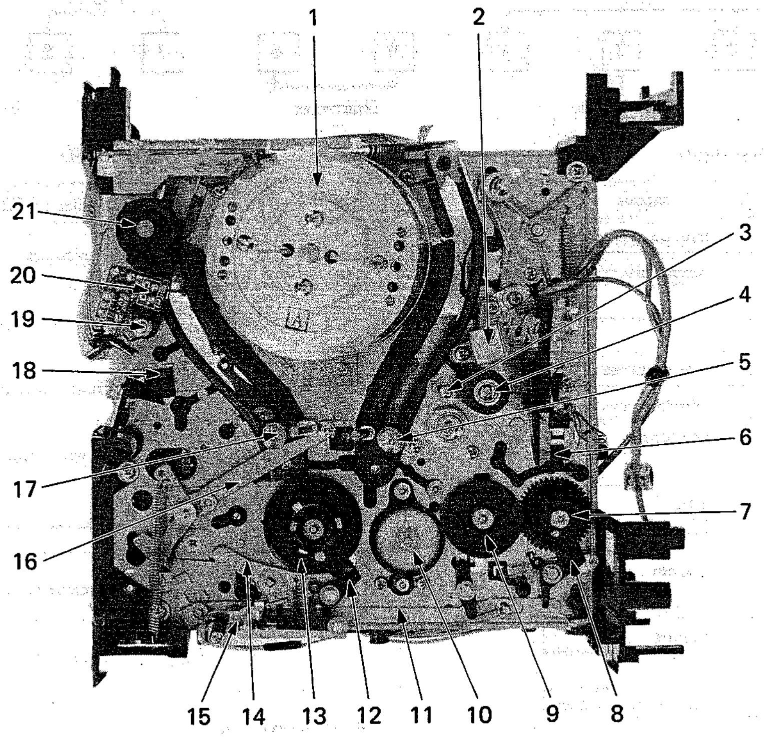


Fig. 7-1 Top view

Symbol No.	Part Name	Part No.
1	Upper Drum Assembly	PU33620A
2	Audio/Control Head	PU53065
3	Tape Guide	PU53629-2
4	Pinch Roller Assembly	PU53067A
5	Take-up Guide Roller Ass'y	PU53046A
6	Cassette Switch	PU52732
7	Take-up Gear	PU52991
8	Take-up Brake Arm Ass'y	PU53012A
9	Take-up Pulley	PU52992
10	Idler Arm	PU52990
11	Slide Lever Ass'y	PU53002B
12	Supply Brake Arm Ass'y	PU53015A
13	Supply Reel Disk	PU53000
14	Cancel Lever Ass'y	PU53017A
15	REC Safety Switch	PU53083
16	Tension Arm Ass'y	PU52997A
17	Supply Pole Base Ass'y	PU53044A
18	Dew Sensor	PU53091
19	Guide Pole	PU53058
20	Full Erase Head	PU53056
21	Roller Ass'y	PU53055A

Table 7-1

7.2.2 Bottom view and parts identification

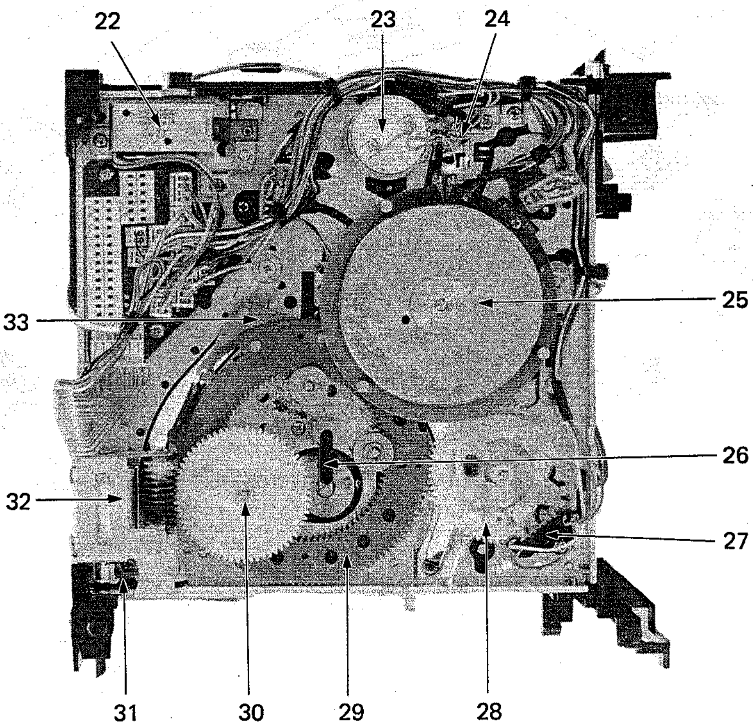


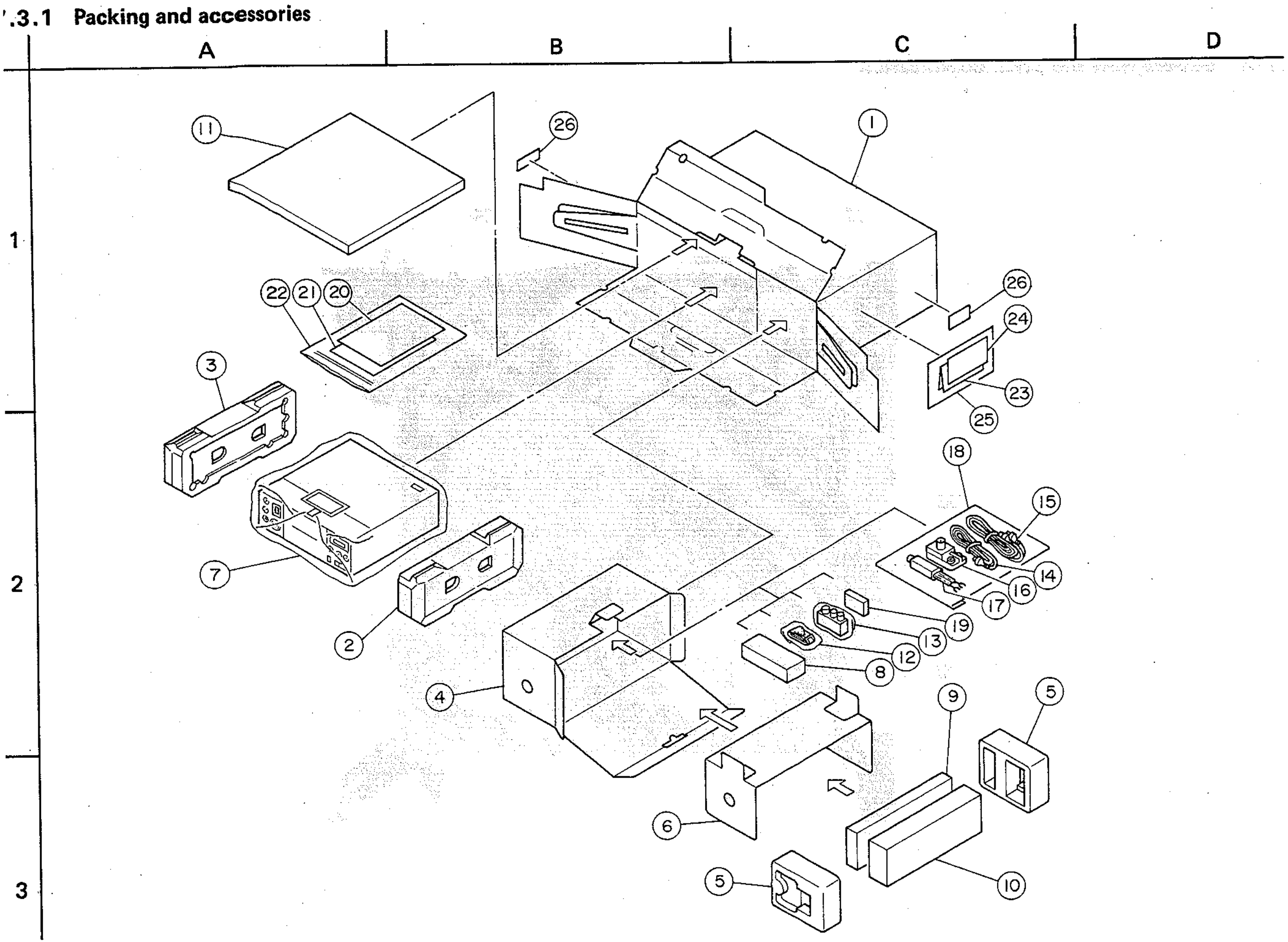
Fig. 7-2 Bottom view

Symbol No.	Part Name	Part No.
22	Brake Solenoid	PU53004
23	Reel Motor Ass'y	PU53585V
24	Solenoid Switch	PU53083
25	Capstan Motor	PU53066V
26	Brush	PU53092
27	Loading Switch	PU53088
28	Cam Gear	PU33551-2
29	Drive Ring Ass'y (L)	PU53024A
30	Worm Wheel Ass'y	PU53036A
31	Loading Belt	PUM30003-6
32	Loading Motor	PU53039V
33	Drive Ring Ass'y (R)	PU53021B

Table 7-2

.3 EXPLODED VIEWS AND PARTS LIST

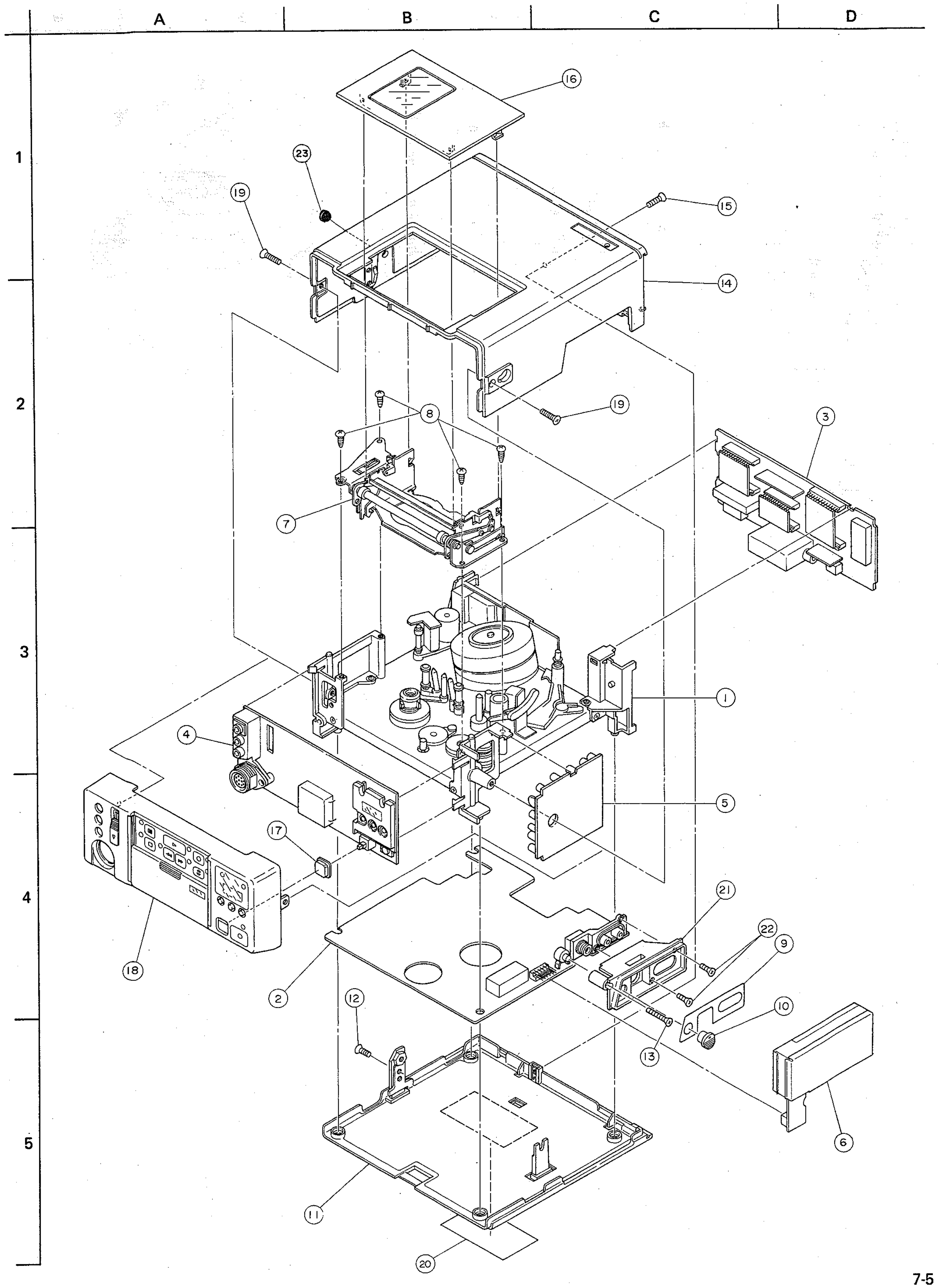
.3.1 Packing and accessories



— Packing and accessories —

Symbol No.	Part No.	Part Name	Description	Symbol No. Postion	Q'ty
1	PU21516	Packing Case		1-C	1
	" -2	"	for silver finish		1
2	PUP10278	Cushion (A)		2-A	1
3	PUP10279	" (B)		1-A	1
4	PU33768	Accessory Case		2-B	1
5	PUP20321	Cushion (C)		3-B	1
6	PU33770	Spacer		3-B	1
7	PUM30021-31	Poly Bag		2-A	1
8	PU33697B	Remote Control Unit	RM-P3U	2-C	1
9	PU53510B	Battery Pack (S)	NB-P3U	2-C	1
10	PU53200B	Battery Charger	BB-P3U	3-C	1
11	PU53639A-1	Carrying Case	CB-P3U	1-A	1
12	PU53589	Shoulder Strap		2-C	1
13	PU53593-2	ANT Select Box		2-C	1
14	PU47310B	Cable Assembly (RF)		2-C	1
15	PU42219E	Cable Assembly (VHF)		2-C	1
16	PU51305	Matching Transformer	75 Ω – 300 Ω	2-C	1
17	PU42708	"	300 Ω – 75 Ω	2-C	1
18	QPGA015-03005	Poly Bag		2-C	1
19	PTC-20U	Cassette Tape	TC-20	2-C	1
20	PU33761	Instruction Guide		1-A	1
21	PU30425-476	Instructions		1-A	1
22	QPGB024-03404	Poly Bag		1-A	1
23	PU50489	Toll Free Card		1-C	1
24	PU30908-11	Warrnty Card		1-C	1
25	PU43149-2	Poly Bag		2-C	1
26	PUP40329	SER. No. Sticker		1-C	2

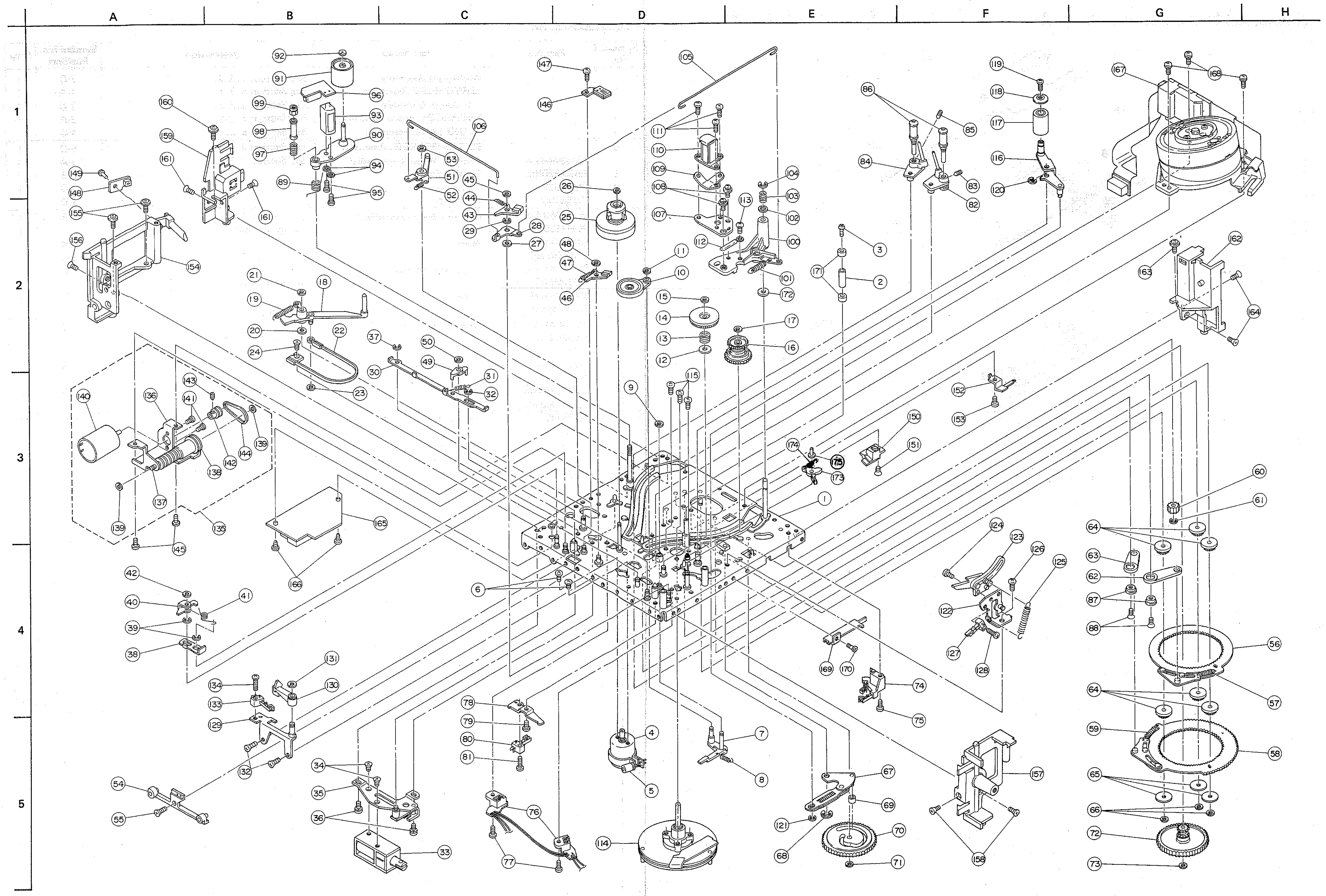
7.3.2 Cabinet assembly



— Cabinet assembly list —

Symbol No.	Part No.	Part Name	Description	Symbol No. Position	Q'ty
1	—	Mechanism Assembly	See Section 7.3.3.	3-C	1
2	—	SERVO Board Assembly	See Section 8.2.1.	4-A	1
3	—	Y/C Board Assembly	See Section 8.2.2.	2-D	1
4	—	MECHACON Board Assembly	See Section 8.2.5.	3-A	1
5	—	AUDIO Board Assembly	See Section 8.2.4.	4-C	1
6	—	SWITCHING REG. Assembly	See Section 8.2.9.	5-D	1
7	PUS26487A	Cassette Housing Assembly	See Section 7.3.5.	3-A	1
8	SBSA2608Z	Tapping Screw		2-B	4
9	PU33632	Connector Panel		4-D	1
10	PU53196	VR Knob		4-D	1
⚠ 11	PU21393A-3	Bottom Cover Assembly		5-B	1
	PUP21393C	〃	for silver finish		1
12	SSSP2606Z	Screw		4-B	1
13	SSSP2620Z	〃		5-C	1
⚠ 14	PU10544A-6	Top Cover Assembly		2-C	1
	PU10544C	〃	for silver finish		1
15	SSSP2606M	Screw		1-C	1
	SSSP2606R	〃	for silver finish		1
16	PU33631A	Cassette Cover Assembly		1-C	1
	PU33631C	〃	for silver finish		1
17	PU53191	Push Button		4-A	1
⚠ 18	PU21394A-3	Front Cover Assembly		4-A	1
	PU21394C	〃	for silver finish		1
19	SSSP3008MS	Screw		1-A, 2-C	2
	SSSP3008RS	〃	for silver finish		1
⚠ 20	PU33742	Rating Label		5-B	1
	PU33742-3	〃	for silver finish		1
21	PU33573-1-6	Connector Cover		4-C	1
22	SSSB2606M	Tapping Screw		4-C	2
23	PU54382	Push Cap		1-B	1
	〃 -2	〃	for silver finish		1

7.3.3 Mechanism assembly



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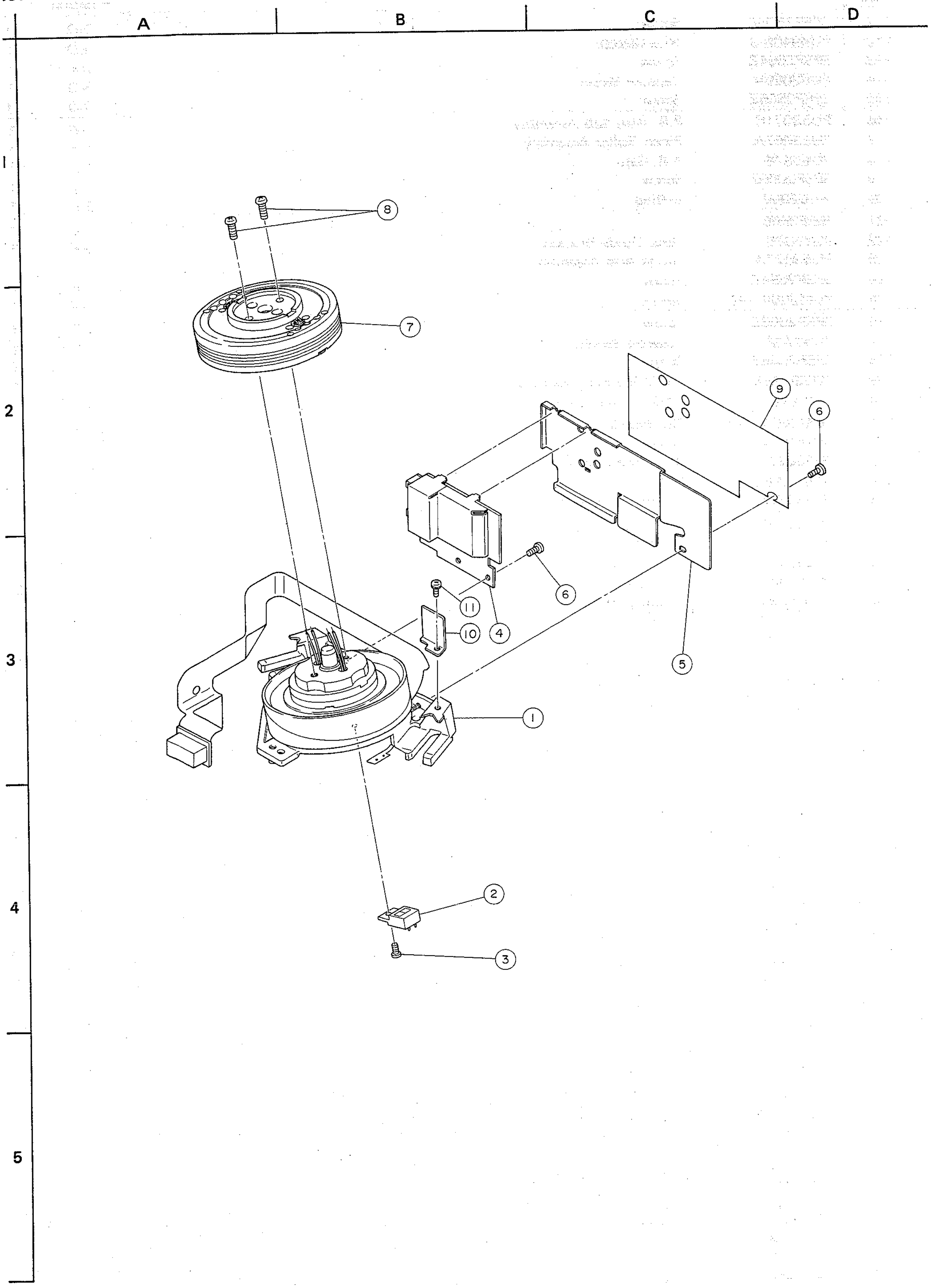
– Mechanism assembly list –

Symbol No.	Part No.	Part Name	Description	Symbol No. Position	Q'ty
1	PU10536B	Deck Assembly	Incl. (2) and (3)	3-E	1
2	PU53629-2	Tape Guide		2-E	1
3	SDSP2004N	Screw		2-E	1
⚠ 4	PU53585V	Reel Motor Assembly	Incl. (5)	5-D	1
5	QEN41HM-105	Electrolytic Capacitor		5-D	1
6	SPSP2604Z	Screw		4-C	2
7	PU52989A	Idler Lever Assembly	Incl. (8)	5-E	1
8	PUM30001-69	Spring		5-E	1
9	PUM30017-7	Slit Washer		3-D	1
10	PU52990	Idler Arm		2-D	1
11	PUM30017-7	Slit Washer		2-D	1
12	Q03093-832	Washer		2-D	1
13	PUM30002-36	Spring		2-D	1
14	PU52992	Take-up Pulley		2-D	1
15	PUM30017-5	Slit Washer		2-D	1
16	PU52991	Take-up Gear		2-E	1
17	PUM30017-7	Slit Washer		2-E	1
18	PU52997A	Tension Arm Assembly	Incl. (19)	2-B	1
19	PUM30001-80	Spring		2-B	1
20	Q03093-827	Washer		2-B	1
21	PUM30017-5	Slit Washer		2-B	1
22	PU52993A	Tension Band Assembly		2-B	1
23	PUM30017	Slit Washer		3-B	1
24	SSSP2606Z	Screw		2-B	1
25	PU53000	Supply Reel Disk		2-D	1
26	PUM30017-5	Slit Washer		1-D	1
27	Q03093-819	Washer		2-C	1
28	PU53001	Connect Lever		2-C	1
29	REE3000	E-Ring		2-C	1
30	PU53002B	Slide Lever Assembly	Incl. (31)	3-B	1
31	PU53314-2	Spring		3-C	1
32	REE2500	E-Ring		3-C	1
33	PU53004	Brake Solenoid		5-C	1
34	SSSP2603Z	Screw		5-B	2
35	PU53005A	Solenoid Bracket Assembly		5-B	1
36	PU54082	Screw		5-B	2
37	REE2500	E-Ring		2-B	1
38	PU53009	Eject Lock Lever		4-A	1
39	REE2500	E-Ring		4-A	2
40	PU53010	Eject Lock Cam		4-A	1
41	PU53011	E.L. Lever Spring		4-B	1
42	Q03093-826	Washer		4-A	1
43	PU53012A	Brake Arm Assembly	Incl. (44)	2-C	1
44	PUM30001-71	Spring		2-C	1
45	PUM30017-4	Slit Washer		1-C	1
46	PU53015A	Brake Arm Assembly	Incl. (47)	2-D	1
47	PUM30001-78	Spring		2-D	1
48	PUM30017-4	Slit Washer		2-D	1
49	PU53016	Idler Cancel Lever		3-C	1
50	PUM30017-4	Slit Washer		2-C	1
51	PU53017A	Cancel Lever Assembly	Incl. (52)	1-C	1
52	PUM30001-79	Spring		2-C	1
53	PUM30017-6	Slit Washer		1-C	1
54	PU53020	Connector Base		5-A	1
55	SPSP2606Z	Screw		5-A	1

Symbol No.	Part No.	Part Name	Description	Symbol No. Position	Q'ty
56	PU53021B	Drive Ring Assembly (R)	Incl. (57)	4-H	1
57	PUM30001-74	Spring		5-H	1
58	PU53024A	Drive Ring Assembly (L)	Incl. (59)	5-H	1
59	PUM30001-81	Spring		5-G	1
60	PU53026	Drive Gear (2)		3-H	1
61	PUM30017-6	Slit Washer		3-H	1
62	PU53027	Loading Arm (R)		4-G	1
63	PU53028	〃 (L)		4-G	1
64	PU53029	Ring Guide (1)		3-G, 4-G	6
65	PU53030	〃 (2)		5-G	3
66	PUM30017-6	Slit Washer		5-G	3
67	PU53031A	P. Roller Cam Assembly		5-E	1
68	REE4000	E-Ring		5-E	1
69	PUM30005-11	Collar		5-E	1
70	PU33551-2	Cam Gear		5-E	1
71	PUM30017-6	Slit Washer		5-E	1
72	PU53036A	Worm Wheel Assembly		5-G	1
73	PUM30017-6	Slit Washer		5-G	1
74	PU53088	Loading Switch		4-F	1
75	SPSP2606Z	Screw		5-F	1
76	—	Reel SENSOR Board Assembly	See Section	5-C	2
77	SPSP2606Z	Screw		5-C	2
78	PU53819	Switch Bracket		4-C	1
79	SPSP2603Z	Screw		5-C	1
80	PU53083	Solenoid Switch		5-C	1
81	SPSP2608Z	Screw		5-C	1
82	PU53040A	Pole Base Assembly (T.U.)	Incl. (83)	2-F	1
83	YFS2025S	Setscrew		1-F	1
84	PU53044A	Pole Base Assembly (SP.)	Incl. (85)	1-E	1
85	YFS2025S	Setscrew		1-F	1
86	PU53046A	Guide Roller Assembly		1-E	2
87	PU53051	Flange Collar		4-G	2
88	SSSP2606Z	Screw		4-G	2
89	PU53057	F.E.H. Arm Spring		1-B	1
90	PU53053A	F.E.H. Arm Sub Assembly		1-B	1
91	PU53055A	Roller Assembly		1-B	1
92	PUM30017	Slit Washer		1-B	1
93	PU53056	Full Erase Head		1-B	1
94	WSB2000N	Washer		1-B	2
95	SPSP2005Z	Screw		1-B	2
96	—	F.E. HEAD Board Assembly	See Section	1-B	1
97	PUM30002-31	Spring		1-B	1
98	PU53058	Guide Pole		1-B	1
99	PU49276	Nylon Nut		1-B	1
100	PU53059A	Head Arm Assembly	Incl. (101)	2-E	1
101	PUM30001-75	Spring		2-E	1
102	WNB4000N	Washer		2-E	1
103	PUM30002-32	Spring		2-E	1
104	REE3000	E-Ring		1-E	1
105	PU53061-2	Rod (1)		1-D	1
106	PU53062	Rod (2)		1-C	1
107	PU53063	Head Base (1)		2-D	1
108	DPSP2606Z	Screw		1-D	2
109	PU53064-2	Head Spring Plate		1-D	1
110	PU53065-3	A/C Head		1-D	1

Symbol No.	Part No.	Part Name	Description	Symbol No. Position	Q'ty
111	SPSP2606Z	Screw		1-D	3
112	PU49485-3	Wire Clamp		2-D	1
113	SPSP2604Z	Screw		2-E	1
⚠114	PU53066V	Capstan Motor		5-D	1
115	SPSP2606Z	Screw		3-D	3
116	PU53071C	P.R. Arm Sub Assembly		1-F	1
117	PU53067A	Pinch Roller Assembly		1-F	1
118	PU53878	P.R. Cap		1-F	1
119	SPSP2005Z	Screw		1-F	1
120	REE3000	E-Ring		2-F	1
121	REE2500	"		5-E	1
122	PU53076	Door Guide Bracket		4-F	1
123	PU53077A	Guide Arm Assembly		3-F	1
124	SPSP2604Z	Screw		3-F	1
125	PUM30001-92	Spring		4-F	1
126	SPSP2603Z	Screw		4-F	1
127	PU52732	Cassette Switch		4-F	1
128	SPSP2608Z	Screw		4-F	1
129	PU53085A	REC. Bracket Assembly		5-B	1
130	PU53087	REC. Safety Lever		4-B	1
131	PUM30017-3	Slit Washer		4-B	1
132	SSSP2604Z	Screw		5-B	1
133	PU53083	REC. Safety Switch		4-B	1
134	SPSP2608Z	Screw		4-B	1
⚠135	PU53037A	Loading Gear Assembly		3-B	1
136	PU53038	Drive Gear Bracket		3-A	1
137	PU53212	Shaft		3-A	1
138	PU53213A	Worm Gear		3-B	1
139	PUM30017	Slit Washer		3-A, 3-B	2
⚠140	PU53039V	Loading Motor		3-A	1
141	SPSP2003Z	Screw		3-A	2
142	PU53214	L. Motor Pulley		3-B	1
143	YFS2603	Setscrew		3-A	1
144	PUM30003-6	Loading Belt		3-B	1
145	LPSP2606Z	Screw		4-A	2
146	PU53091	Dew Sensor		1-C	1
147	SPSP2603Z	Screw		1-C	1
148	–	P. TRANSISTOR Board Assembly	See Section	1-A	1
149	PU48973-3	Stopper		1-A	1
150	–	LED Board Assembly	See Section	3-F	1
151	SSSP2606Z	Screw		3-F	1
152	PU53092	Brush		3-F	1
153	SPSP2604Z	Screw		3-F	1
154	PU21407A	Supporter Assembly (1)		2-A	1
155	SWSP2606Z	Screw		2-A	2
156	SSSP2606Z	"		2-A	1
157	PU33575	Supporter (2)		5-F	1
158	SSSP2606Z	Screw		5-F	2
159	PU53281A	Supporter Assembly (3)		1-A	1
160	SWSP2606Z	Screw		1-A	1
161	SSSP2606Z	"		2-B, 1-A	2
162	PU33577-1-2	Supporter (4)		2-G	1
163	SWSP2606Z	Screw		2-G	1
164	SSSP2606Z	"		2-H	2
165	–	JUNCTION Board Assembly	See Section	3-B	1
166	SBSA2608Z	Tapping Screw		4-B	2
167	–	Drum Assembly	See Section	1-G	1
168	LPSP2606Z	Screw		1-G	3
169	PU54044	Wire Holder		4-E	1
170	SPSP2604Z	Screw		4-E	1
171	PU54262	Tape Guide (B)		2-E	2
172	Q03093-127	Washer		2-E	1
173	PU54198A	Tension Brake Assembly	Incl. (174)	3-E	1
174	PUM30001-71	Spring		3-E	1
175	PU54243	Cap		3-E	1

.3.4 Drum assembly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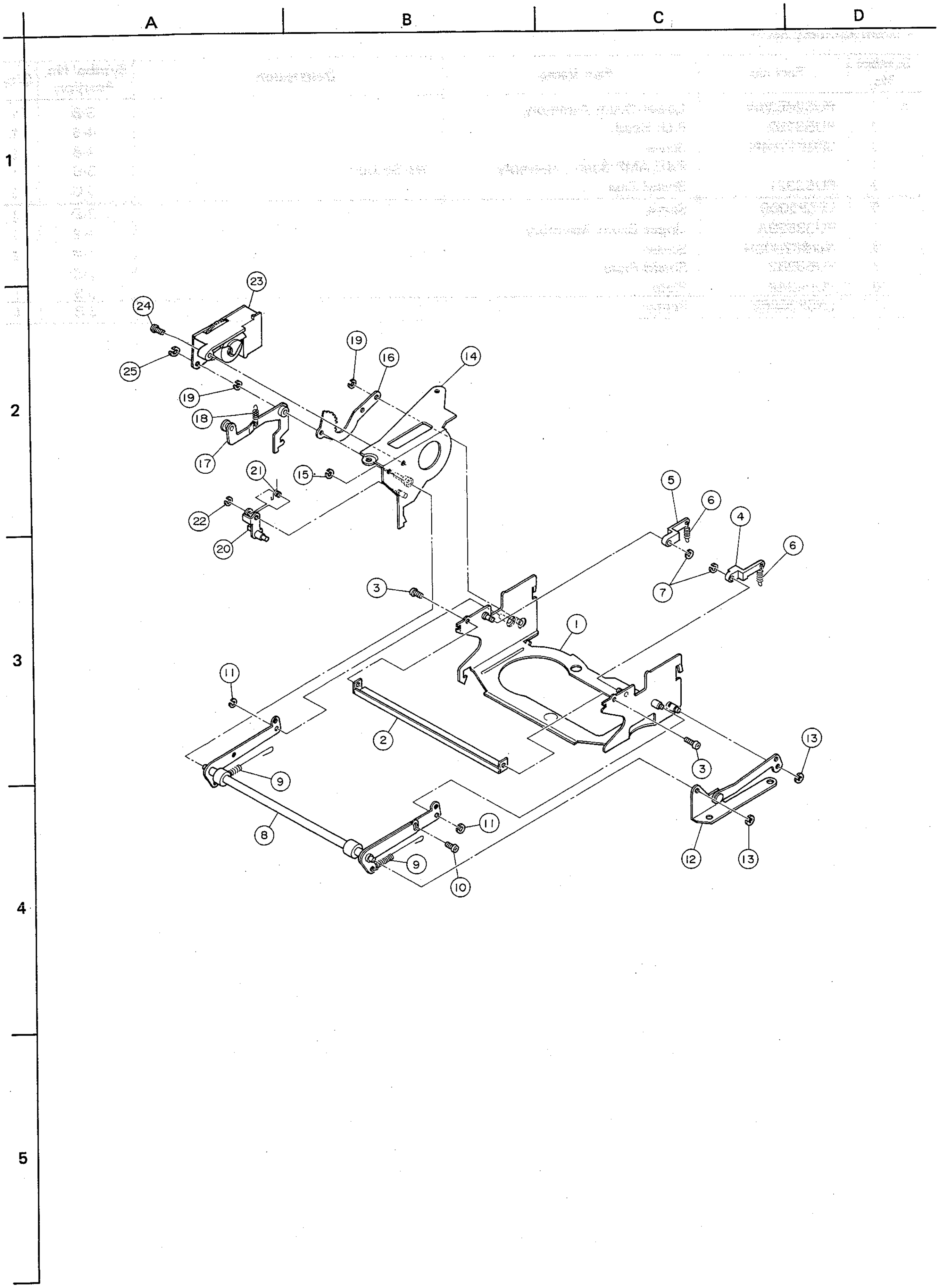
– Drum assembly list –

Symbol No.	Part No.	Part Name	Description	Symbol No. Position	Q'ty
⚠ 1	PUS26539A	Lower Drum Assembly		3-B	1
2	PU53162	P.U. Head		4-B	1
3	SPBP1704N	Screw		4-B	1
4	–	PRE AMP Board Assembly	See Section	3-B	1
5	PU53321	Shield Case		3-C	1
6	LPSP2006	Screw		2-D	2
7	PU33620A	Upper Drum Assembly		2-B	1
8	NDBP2608N	Screw		1-B	2
9	PU53982	Shield Plate		2-D	1
10	PU54349	Plate		3-B	1
11	LPSP2606Z	Screw		3-B	1

7.3.5 Cassette housing assembly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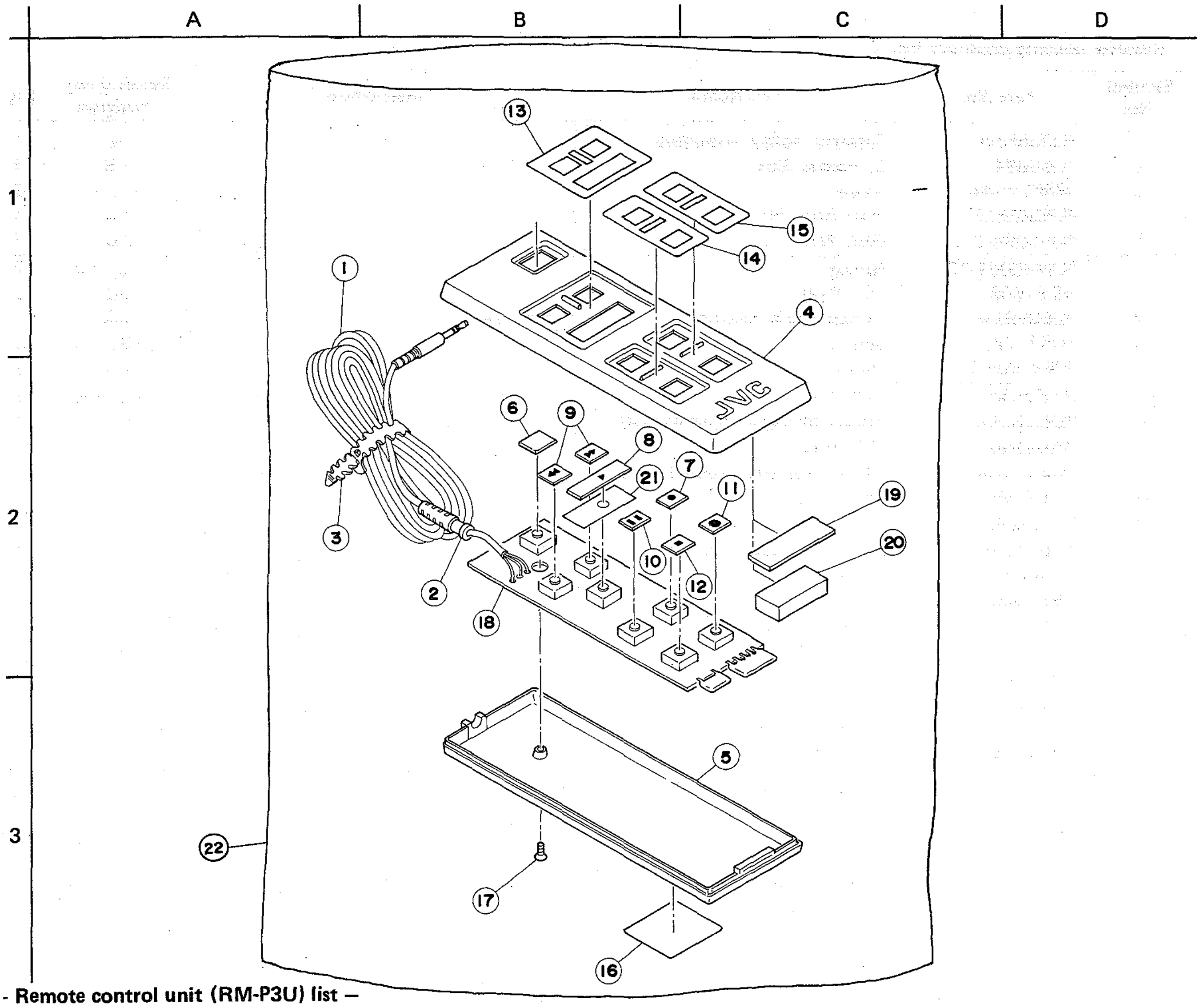
— Cassette housing assembly list —

Symbol No.	Part No.	Part Name	Description	Symbol No. Position	Q'ty
1	PU33553A	Cassette Holder Assembly		3-C	1
2	PU53094	C. Holder Stay		3-B	1
3	SPSP2003M	Screw		3-B, 3-C	2
4	PU53095-2	Push Arm (R)		2-C	1
5	PU53096-2	Push Arm (L)		2-C	1
6	PUM30001-77	Spring		2-C, 3-D	2
7	REE1500	"E" Ring		3-C	2
8	PU53097A	Holder Shaft Assembly	Incl. (9)	4-A	1
9	PU53322	Spring		4-B, 3-A	2
10	SPSP2604Z	Screw		4-B	1
11	REE2500	"E" Ring		3-A, 4-B	2
12	PU53103A	Holder Bracket Assembly (R)		4-C	1
13	REE2500	"E" Ring		3-D, 4-C	2
14	PU53107A	Holder Bracket Assembly (L)		2-B	1
15	REE2500	"E" Ring		2-B	1
16	PU53505	C. Holder Arm (L)		2-B	1
17	PU53109A	Eject Arm Assembly (1)	Incl. (18)	2-A	1
18	PUM30001-69	Spring		2-A	1
19	REE2500	"E" Ring		2-A, 2-B	2
20	PU53112A	Eject Arm Ass'y (2)		3-A	1
21	PU53115	Spring		2-A	1
22	REE2500	"E" Ring		2-A	1
23	PU53245	Damper		1-A	1
24	DPSP2610Z	Screw		2-A	1
25	REE2500	"E" Ring		2-A	1

.3.6 Remote control unit (RM-P3U)



- Remote control unit (RM-P3U) list –

Symbol No.	Part No.	Part Name	Description	Symbol No. Position	Q'ty
⚠ 1	PU33697-100	Cord Ass'y			
2	" -101	Busling			
3	" -120	Band			
4	" -102	Upper Case Ass'y	Incl. (13), (14), (15)		
5	" -107	Under Case Ass'y	Incl. (16)		
6	" -110	POWER BUTTON	(BLUE)		
7	" -111	REC "	(ORANGE)		
8	" -112	PLAY "	(GRAY)		
9	" -113	FF, REW "	(")		
10	" -114	PAUSE "	(")		
11	" -115	A. DUB "	(")		
12	" -116	STOP "	(")		
13	" -104	Top Panel (U)			
14	" -106	" " (L)			
15	" -105	Top Panel (R)			
16	" -109	Label			
17	" -123	Screw			
18	" -121	Remote Control P.W.B Ass'y	See Section 8.2.12.		
19	" -117	Weight			
20	" -118	Separater			
21	" -119	Insulator Sheet			
22	" -124	Poly Bag			

SECTION 8
ELECTRICAL PARTS LIST

SAFETY PRECAUTION

Parts identified by the ⚠ symbol are critical for safety. Replace only with specified part numbers.

ABBREVIATIONS IN THIS LIST ARE AS FOLLOWS:

RESISTORS – All resistance values are in ohms (Ω).

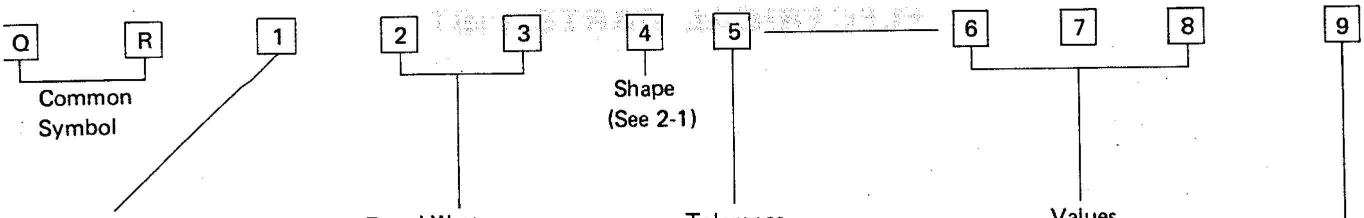
K : 1 000
M : 1 000 000
CR : Carbon Resistor
Comp. R: Composition Resistor
WR : Wire Wound Resistor
OMR : Oxide Metal Film Resistor
VR : Variable Resistor (Potentiometer)
MFR : Metal Film Resistor
FR : Fusible Resistor
PMR : Precision Metal Film Resistor

CAPACITORS – All capacitance values are in μF, unless otherwise indicated.

P : μμF
C Cap : Ceramic Capacitor
E Cap : Electrolytic Capacitor
FM Cap : Film Mica Capacitor
MM Cap : Metalized Mylar Capacitor
MP Cap : Metalized Paper Capacitor
MY Cap : Mylar Capacitor
NP Cap : Non-polar Capacitor
PC Cap : Polycarbonate Capacitor
PP Cap : Poly Pro Capacitor
PS Cap : Polystyrol Capacitor
T Cap : Tantalum Capacitor
TR Cap : Trimmer Capacitor
LL Cap : Low Leak Current Electrolytic Capacitor
TF Cap : Thin Film Capacitor

.1 STANDARD PART NUMBER CODING

.1.1 Fixed Resistor Coding



Type of resistor

C	Composition Resistor
D	Carbon Resistor
F	Unflammable Resistor
G	Oxide Metal Film Resistor
M	Metal Plate Resistor
X	Metal Film Resistor
W	Wire Wound Resistor
Y	Wire Wound Resistor
V	Metal Film Resistor, High Stability
Z	Special Resistor
S	Chip Resistor

Rated Wattage

Symbol	Rated wattage
16	1/6 (W)
18	1/8 "
14	1/4 "
12	1/2 "
01	1 "
02	2 "
03	3 "
04	4 "
05	5 "
06	6 "
07	7 "
75	7.5 "
08	8 "
10	10 "
15	15 "
20	20 "
30	30 "

Tolerance

Symbol	Tolerance
F	±1 %
G	±2 %
J	±5 %
K	±10 %
M	±20 %

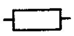
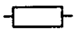
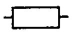
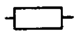
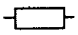
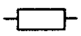
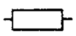
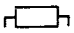
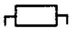
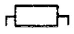
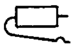
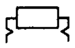
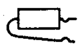
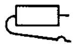
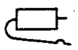
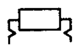
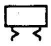
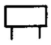
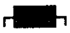
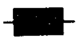
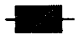
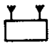
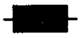
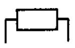
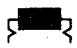
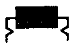
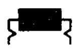
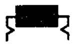
Values

–Example –		
R47		0.47 Ω
4R7		4.7 Ω
470	47 x 10^0	47 Ω
471	47 x 10^1	470Ω
472	47 x 10^2	4.7 KΩ
473	47 x 10^3	47 KΩ
474	47 x 10^4	470 KΩ
475	47 x 10^5	4.7 MΩ
10R2		10.2 Ω
1430	143 x 10^0	143 Ω
1581	158 x 10^1	1.58 KΩ

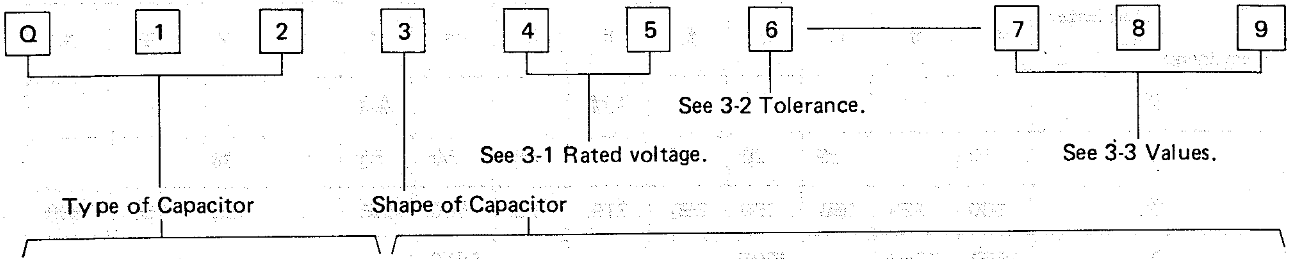
Size

Symbol	Size
A	Small Size
S	Small Size

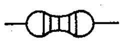
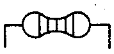
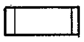
2-1 Shape of resistor (▨ : Flame retardant resistor)

Sort	C	D	G	F	M	W	X	Y	V
1									
2									
3									
4									
5						L type			
6						Resin Covered			
7						Enameled			
8									
9									

8.1.2 Fixed Capacitor Coding


Q
1
2
3
4
5
6
7
8
9
See 3-2 Tolerance.
See 3-1 Rated voltage.
See 3-3 Values.
Type of Capacitor
Shape of Capacitor

Ceramic Capacitors

Symbol	Type of Capacitor	Disk Lead	Kink Lead			
QCF	Ceramic	1	3			
QCS	〃	1	3			
QCY	〃	1, 4	3			8
QCT	Temperature compensation					
QCZ	Special					
QCX	〃			1	3	

Electrolytic Capacitors

Symbol	Type of Capacitor	Tubular	Mono-direction	Anti-stress	Forming	Snap-in
QEA	Characteristic A	2	4			
QED	Characteristic D	2	4			
QEE	Tantalum		4	5		
QEE	〃 (small type)		8			
QEN	Non-polar	2	4	5	6	
QEW	Characterisitc W	2	4	5	6	7
QET	Characteristic W (small type)	2	4	5	6	
QEK	Characteristic W (subminiature type)		4	5		
QEZ	Special					

Paper Film Capacitors

Symbol	Type of Capacitor	Tubular	Normal		Flame retardant	
			Mono-direction	Kink Lead	Mono-direction	Kink Lead
QFF	Film mica		4			
QFH	Metalized mylar	2	4	3	5	6
QFM	Mylar	2	4	3, 7	5	6
QFN	〃 (small type)		4			
QFP	Polypropylene		4	3		
QFS	Polystyrole	2	4	3		
QFZ	Special					

1) Rated voltage (V)

2nd letter / First letter	A	B	C	D	E	F	G	H	J	K	V	W	X
0						3.15			6.3				
1	10		16	20	25		40	50	63		35		
2	100	125	160	200	250	315	400	500	630		350	450	600
3	1000	1250		2000				5000					

2) Tolerance

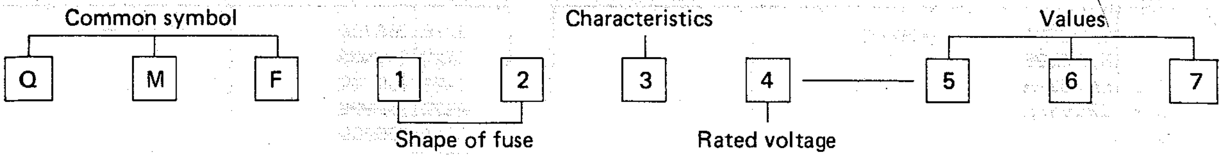
Symbol	F	G	J	K	M	Z	P	A	H	R
(%)	± 1	± 2	± 5	± 10	± 20	+ 80 − 20	+ 100 − 0	+ 100 − 10	+ 50 − 10	+ 30 − 10

3) Values

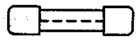
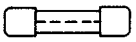
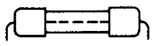
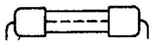
– Example – Values are in picofarads.

101 ..... 10×10^1 ..... 100 pF
102 ..... 10×10^2 ..... 1,000 pF
103 ..... 10×10^3 ..... 10,000 pF = 0.01 μF
104 ..... 10×10^4 ..... 100,000 pF = 0.1 μF
5R0 ..... 5.0 ..... 5 pF

8.1.3 Fuse Coding



Shape of Fuse (first and second digit)

Symbol No.	Shape	Remarks
51		φ 5.2 x 20
60		φ 6.4 x 30
61		φ 6.35 x 31.8
63		With 60 Lead Wire
66		With 61 Lead Wire

Rated Voltage (fourth digit)

Symbol No.	Rated Voltage
1	AC 125 V
2	AC 250 V

Value (fifth – seventh digit)

– Example –

R10	0.1 A
R125	0.125 A
1R0	1.0 A
1R2	1.2 A
1R25	1.25 A
100	10 A

Characteristics (third digit)

Symbol No.	Fusing Current	Fusing Time	Remarks
S	160%	Within 1 hr.	Anti-rush Type
	200%	〃 2 min.	
	700% – 2000%	〃 0.01 sec.	
R	160%	〃 1 hr.	Regular Fusible Type
	200%	〃 2 min.	
M	135%	〃 1 hr.	Regular Fusible Type (for UL)
	200%	〃 2 min.	
U	135%	〃 1 hr.	Anti-rush Type (for UL)
	200%	〃 2 min.	
	800% – 2000%	〃 0.01 sec.	
A	210%	〃 2 min.	Anti-rush Type (for Europe)
	275%	0.5 – 10 sec.	
	400%	0.15 – 2 sec.	
	1000%	0.02 – 0.3 sec.	
B	210%	Within 30 min.	Regular Fusible Type (for SEMKO, Europe)
	275%	0.05 – 2 sec.	
	400%	0.01 – 0.3 sec.	

3.2 ELECTRICAL PARTS LIST BY ASSEMBLIES

3.2.1 Servo & MDA Ass'y $\boxed{0}\boxed{1}$ PU10563A-2-CM

Symbol No.	Part No.	Part Name	Recommended Part/ Description
IC 1	BAF6303	Flat I.C.	
IC 2	BAF6305	"	
IC 3	BAF851A	"	
IC 4	UPC451G	"	
IC 5	"	"	
IC 6	BAF225	"	
IC 7	UPC1251G	"	
IC 8	M54577FP	"	
IC 9	M54576FP	"	
IC10	M54577FP	"	
IC11	"	"	
IC201	UPC451G	Flat I.C.	
IC202	UPC177G	"	
IC203	NJM78L05A	I.C.	
IC301	M54543L	I.C.	
IC302	M54545L	"	or M54545L
Q 1	2SB709	Chip Transistor	
Q 2	–	–	
Q 3	2SB709	Chip Transistor	
Q 4	2SD601	"	
Q 5	2SB710	"	
Q 6	2SD601	"	
Q 7	"	"	
Q 8	"	"	
Q 9	"	"	
Q10	"	"	
Q11	2SB709	"	
Q12	"	"	
Q13	2SD602	"	
Q14	"	"	
Q15	2SB709	"	
Q16	"	"	
Q17	2SD601	"	
Q18	2SB709	"	
Q19	2SD601	"	
Q20	"	"	
Q21	"	"	
Q201	2SD601	Chip Transistor	
Q202	2SB709	"	
Q203	2SD601	"	
Q204	"	"	
Q205	"	"	
Q206	"	"	
Q207	"	"	
Q208	"	"	
Q209	"	"	
Q210	–	–	
Q211	2SB798	Chip Transistor	
Q212	"	"	
Q213	"	"	
Q214	"	"	
Q215	2SB709	"	
Q216	2SD999	"	
Q217	2SB709	"	
Q218	2SD999	"	
Q219	2SB709	Chip Transistor	
Q220	2SD999	"	
Q221	2SB709	"	
Q222	2SD999	"	
Q223	2SB709	"	
Q224	–	–	
Q225	2SB601	Chip Transistor	
Q226	"	"	
Q227	"	"	
Q228	"	"	
Q229	"	"	
Q301	2SD601	Chip Transistor	
Q302	"	"	
Q303	2SB709	"	
Q304	2SC3073	Transistor	
Q305	2SD601	Chip Transistor	
Q306	2SB709	"	
Q307	2SC2873	"	
Q308	2SD601	"	
Q309	"	"	
Q310	2SB709	"	
Q311	2SD601	"	
Q312	2SC3073	Transistor	
Q313	2SD601	Chip Transistor	
Q314	2SB709	"	
Q315	2SC2873	"	
Q316	2SB710	"	
D 1	–	–	
D 2	MA151WA	Chip Diode	
D 3	"	"	
D 4	MA151WK	"	
D 5	"	"	
D 6	"	"	
D 7	"	"	
D 8	MA151WA	"	
D 9	"	"	
D10	–	–	
D11	MA151WA	Chip Diode	
D12	"	"	
D13	"	"	
D14	MA151WK	"	
D15	"	"	
D16	"	"	
D17	"	"	
D18	MA151WA	"	
D19	"	"	
D20	"	"	
D21	MA151WK	"	
D22	"	"	
D23	MA151WA	"	
D24	–	–	
D25	MA151WK	Chip Diode	
D26	"	"	
D27	10E2FA8	Diode	
D28	MA151WA	Chip Diode	
D29	MA151WK	"	
D30	MA151WA	"	
D31	"	"	
D32	ISS133	Diode	(or MA150)

Symbol No.	Part No.	Part Name	Recommended Part/ Description
D201	—	—	
D202	MA151WK	Chip Diode	
D203	"	"	
VA 1	PU49624	Varistor	
R 1	QRS188J-473YN	Chip R	
R 2	" -104YN	"	
R 3	QVZ3531-473	VR	SEARCH SPEED
R 4	QRS188J-223YN	Chip R	
R 5	QVZ3531-104	VR	CAP. SAMPLE POS.
R 6	QRS188J-473YN	Chip R	
R 7	" -473YN	"	
R 8	" -103YN	"	
R 9	" -473YN	"	
R10	" -473YN	"	
R11	" -102YN	"	
R12	" -334YN	"	
R13	" -103YN	"	
R14	" -103YN	"	
R15	" -103YN	"	
R16	" -331YN	"	
R17	" -334YN	"	
R18	" -103YN	"	
R19	" -103YN	"	
R20	" -103YN	"	
R21	—	—	
R22	QRS188J-104YN	Chip R	
R23	QVZ3531-474	VR	CH-1 SW PHASE
R24	QRS188J-223YN	Chip R	
R25	" -104YN	"	
R26	QVZ3531-474	VR	CH-2 SW PHASE
R27	QRS188J-223YN	Chip R	
R28	" -103YN	"	
R29	" -473YN	"	
R30	" -473YN	"	
R31	" -393YN	"	
R32	—	—	
R33	—	—	
R34	—	—	
R35	QRS188J-104YN	Chip R	
R36	QVZ3531-473	VR	REC PHASE
R37	QRS188J-223YN	Chip R	
R38	" -105YN	"	
R39	QVZ3531-104	VR	CTL DUTY
R40	QRS188J-334YN	Chip R	
R41	" -474YN	"	
R42	" -153YN	"	
R43	" -154YN	"	
R44	" -273YN	"	
R45	QVZ3531-224	VR	PRESET
R46	QRS188J-103YN	Chip R	
R47	PU51884-2	VR	TRACKING
R48	QRS188J-184YN	Chip R	
R49	" -153YN	"	
R50	" -104YN	"	
R51	—	—	
R52	QRS188J-334YN	Chip R	
R53	" -0R0Y	"	
R54	—	—	
R55	QRS188J-103YN	Chip R	
R56	" -103YN	"	

Symbol No.	Part No.	Part Name	Recommended Part/ Description
R57	QRS188J-394YN	Chip R	
R58	QVZ3531-105	VR	SEARCH SPEED
R59	QRS188J-103YN	Chip R	
R60	" -224YN	"	
R61	" -183YN	"	
R62	" -473YN	"	
R63	" -104YN	"	
R64	" -103YN	"	
R65	" -683YN	"	
R66	" -822YN	"	
R67	" -103YN	"	
R68	" -473YN	"	
R69	" -102YN	"	
R70	" -102YN	"	
R71	" -102YN	"	
R72	" -104YN	"	
R73	" -683YN	"	
R74	" -104YN	"	
R75	" -683YN	"	
R76	" -105YN	"	
R77	" -224YN	"	
R78	" -103YN	"	
R79	" -474YN	"	
R80	" -105YN	"	
R81	—	—	
R82	QRS188J-103YN	Chip R	
R83	" -334YN	"	
R84	" -683YN	"	
R85	" -102YN	"	
R86	" -184YN	"	
R87	" -104YN	"	
R88	" -104YN	"	
R89	" -104YN	"	
R90	" -473YN	"	
R91	" -101YN	"	
R92	" -103YN	"	
R93	" -103YN	"	
R94	" -473YN	"	
R95	" -473YN	"	
R96	" -103YN	"	
R97	" -103YN	"	
R98	" -103YN	"	
R99	" -473YN	"	
R100	" -103YN	"	
R101	" -332YN	"	
R102	" -473YN	"	
R103	" -473YN	"	
R104	" -473YN	"	
R105	—	—	
R106	QRS188J-473YN	Chip R	
R107	" -102YN	"	
R108	" -102YN	"	
R109	" -100YN	"	
R110	" -472YN	"	
R111	" -563YN	"	
R112	" -564YN	"	
R113	" -473YN	"	
R114	" -472YN	"	
R115	" -473YN	"	
R116	" -564YN	"	
R117	" -103YN	"	
R118	" -181YN	"	
R119	" -104YN	"	
R120	" -103YN	"	
R121	" -223YN	"	

Symbol No.	Part No.	Part Name	Recommended Part/ Description
R122	QRS188J -563YN	Chip R	
R123	" -223YN	"	
R124	" -473YN	"	
R125	" -473YN	"	
R126	" -223YN	"	
R127	" -223YN	"	
R128	" -104YN	"	
R129	" -473YN	"	
R130	" -223YN	"	
R131	" -223YN	"	
R132	" -104YN	"	
R133	" -223YN	"	
R134	" -473YN	"	
R135	" -473YN	"	
R136	" -102YN	"	
R137	QVZ3531-223	VR	CAPSTAN BRAKE
R138	QRS188J-223YN	Chip R	
R139	—	—	
R140	QRS188J -152YN	Chip R	
R141	" -154YN	"	
R142	QRD162J-473	CR	
R143	QRS188J -103YN	Chip R	
R144	" -152YN	"	
R145	" -154YN	"	
R146	" -103YN	"	
R147	" -471YN	"	
R148	" -102YN	"	
R149	" -102YN	"	
R150	" -471YN	"	
⚠ R151	QRZ0054-100	FR	
R152	QRS188J-472YN	Chip R	
R153	" -223YN	"	
R154	" -223YN	"	
R155	" -473YN	"	
R156	" -473YN	"	
R157	" -222YN	"	
R158	" -561YN	"	
R159	" -561YN	"	
R160	QVZ3531-223	VR	DRUM PULSE
R161	QRS188J-681YN	Chip R	
R162	" -223YN	"	
R163	" -223YN	"	
R164	" -223YN	"	
R165	" -473YN	"	
R166	" -223YN	"	
R167	" -680YN	"	
R168	" -6R8YN	"	
R169	" -221YN	"	
R170	" -821YN	"	
R171	" -473YN	"	
R172	" -103YN	"	
R173	" -473YN	"	
R174	" -223YN	"	
R175	" -103YN	"	
R176	" -333YN	"	
R177	QRD161J-564	CR	
R178	" -274	"	
R179	QRS188J-102YN	Chip R	
R201	QRS188J-223YN	Chip R	
R202	" -223YN	"	
R203	" -183YN	"	
R204	" -684YN	"	
R205	" -224YN	"	

Symbol No.	Part No.	Part Name	Recommended Part/ Description
R206	QRS188J -334YN	Chip R	
R207	" -274YN	"	
R208	" -333YN	"	
R209	" -223YN	"	
R210	" -122YN	"	
R211	—	—	
R212	QRS188J -472YN	Chip R	
R213	" -102YN	"	
R214	" -394YN	"	
R215	" -102YN	"	
R216	" -394YN	"	
R217	" -472YN	"	
R218	" -332YN	"	
R219	—	—	
R220	QRS188J-563YN	Chip R	
R221	" -472YN	"	
R222	" -472YN	"	
R223	" -104YN	"	
R224	" -104YN	"	
R225	" -104YN	"	
R226	" -104YN	"	
R227	" -333YN	"	
R228	" -104YN	"	
R229	" -332YN	"	
R230	" -154YN	"	
R231	" -473YN	"	
R232	" -223YN	"	
R233	" -223YN	"	
R234	" -223YN	"	
R235	" -223YN	"	
R236	" -104YN	"	
R237	—	—	
R238	QRS188J -104YN	Chip R	
R239	—	—	
R240	QRS188J -100YN	Chip R	
R241	" -100YN	"	
R242	" -103YN	"	
R243	" -471YN	"	
R244	" -103YN	"	
R245	" -471YN	"	
R246	" -103YN	"	
R247	" -471YN	"	
R248	" -103YN	"	
R249	" -471YN	"	
R250	" -103YN	"	
R251	" -103YN	"	
R252	" -273YN	"	
R253	" -223YN	"	
R254	" -683YN	"	
R255	" -473YN	"	
⚠ R256	QRX019J-R68S	MFR	
R257	QRS188J -124YN	Chip R	
R258	—	—	
R259	QVZ3531-153	VR	DRUM FV
R260	QRS188J -124YN	Chip R	
R261	" -393YN	"	
R262	" -103YN	"	
R263	" -103YN	"	
R264	" -563YN	"	
R265	" -472YN	"	
R301	QRS188J -473YN	Chip R	
R302	" -104YN	"	
R303	" -473YN	"	

Symbol No.	Part No.	Part Name	Recommended Part/ Description
R304	QRS188J -223YN	Chip R	
R305	" -222YN	"	
R306	" -472YN	"	
R307	" -223YN	"	
R308	" -473YN	"	
R309	" -223YN	"	
R310	" -222YN	"	
R311	" -472YN	"	
R312	" -101YN	"	
R313	" -102YN	"	
R314	" -104YN	"	
R315	" -473YN	"	
R316	" -473YN	"	
R317	" -223YN	"	
R318	" -222YN	"	
R319	" -472YN	"	
R320	" -332YN	"	
R321	" -472YN	"	
R322	" -223YN	"	
R323	" -473YN	"	
R324	" -223YN	"	
R325	" -222YN	"	
R326	" -472YN	"	
R327	" -101YN	"	
R328	" -102YN	"	
C 1	QCY81HK-103	Chip Cap	
C 2	QFZ9011-473	MM Cap	
C 3	—	—	
C 4	QFZ9011-184	MM Cap	
C 5	—	—	
C 6	QEK61HM-105	E Cap	
C 7	QCY81HK-101	Chip Cap	
C 8	" -223	"	
C 9	" -103	"	
C10	QEK61CM-106	E Cap	
C11	QEK60JM-476	"	
C12	QCY81HK-102	Chip Cap	
C13	—	—	
C14	QEK61CM-106	E Cap	
C15	QCY81HK-103	Chip Cap	
C16	PU53610J-682	MY Cap	
C17	" -682	"	
C18	QCY81HK-103	Chip Cap	
C19	" -103	"	
C20	" -103	"	
C21	" -103	"	
C22	QFN31HK-333	MY Cap	
C23	QCY81HK-333	Chip Cap	
C24	" -391	"	
C25	QFZ9011-473	MM Cap	
C26	QCY81HK-472	Chip Cap	
C27	" -102	"	
C28	" -103	"	
C29	QFZ9011-104	MM Cap	
C30	QCY81HK-103	Chip Cap	
C31	QEK61CM-106	E Cap	
C32	QCY81HK-103	Chip Cap	
C33	QFZ9011-104	MM Cap	
C34	" -104	"	
C35	" -124	"	
C36	QCY81HK-333	Chip Cap	
C37	" -391	"	

Symbol No.	Part No.	Part Name	Recommended Part/ Description
C38	QCY81HK-102	Chip Cap	
C39	QFZ9011-823	MM Cap	
C40	QCY81HK-103	Chip Cap	
C41	QEK41CM-106	E Cap	
C42	QCY81HK-103	Chip Cap	
C43	QFZ9011-104	MM Cap	
C44	" -104	"	
C45	QEL61EM-475	E Cap	
C46	" -475	"	
C47	QEK61CM-106	"	
C48	QEL61EM-475	"	
C49	" -475	"	
C50	QCY81HK-102	Chip Cap	
C51	—	—	
C52	QCY81HK-272	Chip Cap	
C53	" -223	"	
C54	QEK40JM-476	E Cap	
C55	QCY81HK-103	Chip Cap	
C56	" -102	"	
C57	PU53610J-103	M Cap	
C58	QCY81HK-103	Chip Cap	
C59	—	—	
C60	QEK61EM-335	E Cap	
C61	QCY81HK-223	Chip Cap	
C62	QEK61EM-335	E Cap	
C63	QCY81HK-153	Chip Cap	
C64	" -103	"	
C65	QEK60JM-336	E Cap	
C66	QFZ9011-104	MM Cap	
C67	QFN31HK-273	MY Cap	
C201	QCF81EZ-224	Chip Cap	
C202	QCY81HK-102	"	
C203	QEP61EM-475	NP Cap	
C204	" -475	"	
C205	QFZ9011-473	MM Cap	
C206	QCY81HK-223	Chip Cap	
C207	" -681	"	
C208	" -103	"	
C209	" -822	"	
C210	" -103	"	
C211	" -103	"	
C212	" -103	"	
C213	" -103	"	
C214	" -103	"	
C215	" -103	"	
C216	QFZ9011-104Z	MM Cap	
C301	QEP61CM-106	NP Cap	
C302	" -106	"	
C303	" -106	"	
C304	QFZ9011-104	MM Cap	
C305	" -473	"	
RY-1	PU53359-2	Relay	
	PU53605	A/V Connector	with F Conn.
SW-1	PU51812	Slide Switch	POWER SAVE
	PU53460	Test Pin	TP1—14
	"	"	TP201—203
	"	"	TP301

Symbol No.	Part No.	Part Name	Recommended Part/ Description
X 1	PU47701	Crystal	
⚠	QMF51C3-4R0	Fuse	F1 (4 A)
⚠	" -1R0	"	F2 (1 A)
⚠	" -1R0	"	F3 (1 A)
	PU51212	Fuse Clip	F1, F2, F3
	PU50355-10	Housing	Audio
	" -12	"	SW Reg.
	" -20	"	M. CTL
	" -20	"	"
	" -8	"	Video
	" -14	"	"
	PU53604-12	"	J. P.W.B.
	" -28	"	"
	PU54365	Label	

8.2.2 Y/C P.W.B. Ass'y $\boxed{0}\boxed{2}$ PU21390B-3-M

Symbol No.	Part No.	Part Name	Recommended Part/ Description
IC 1	–	–	
IC 2	MC5333	Integrated Circuit	
IC 3	MC5337	"	
IC 4	MC5338	"	
IC 5	MC5335B	"	
IC 6	MC5334C	"	
IC 7	26VT03	"	
IC 8	MC5378	"	
IC 9	MC5336	"	
IC10	MC5365	"	
Q 1	2SC2787LF	Transistor	
Q 2	"	"	
Q 3	"	"	
Q 4	"	"	
Q 5	"	"	
Q 6	"	"	
D 1	1SS133Y	Diode	
D 2	"	"	
R 1	–	–	
R 2	–	–	
R 3	QRD161J-682	CR	
R 4	QVZ3531-102	VR	DARK CLIP
R 5	QRD161J-822	CR	
R 6	QVZ3531-102	VR	WHITE CLIP
R 7	" -152	"	CARRIER
R 8	QRD161J-681	CR	
R 9	ERTD2FHL-332S	Thermistor	
R10	QRD161J-561	CR	
R11	" -821	"	
R12	QRD167J-102	"	
R13	QVZ3531-471	VR	REC FM LEVEL
R14	QRD161J-222	CR	
R15	" -121	"	
R16	" -223	"	
R17	" -333	"	
R18	" -102	"	
R19	" -561	"	
R20	–	–	
R21	QRD161J-681	CR	
R22	" -563	"	
R23	" -563	"	
R24	" -102	"	
R25	QVZ3531-102	VR	PB Y LEVEL
R26	QRD161J-681	CR	
R27	" -561	"	
R28	" -681	"	
R29	–	–	
R30	–	–	
R31	QRD161J-331	CR	
R32	QVZ3531-471	VR	E-E LEVEL
R33	QRD161J-392	CR	
R34	" -333	"	
R35	" -750	"	
R36	" -821	"	
R37	QVZ3531-222	VR	DEVIATION
R38	QRD161J-822	CR	

Symbol No.	Part No.	Part Name	Recommended Part/ Description
R39	QRD161J-562	CR	
R40	QVZ3531-222	VR	REC COL. LEVEL
R41	QRD181J-151	CR	
R42	QRD161J-223	"	
R43	" -393	"	
R44	" -821	"	
R45	QVZ3531-681	VR	PB COL. LEVEL
R46	QRD161J-102	CR	
R47	QVZ3531-332	VR	PB IN COL. LEVEL
R48	QRD161J-681	CR	
R49	—	—	
R50	QRD161J-820	CR	
R51	" -681	"	
R52	" -102	"	
R53	" -103	"	
R54	" -223	"	
R55	" -564	"	
R56	QVZ3531-103	VR	AFC
R57	" -103	"	CONV. BAL
R58	QRD161J-221	CR	
R59	" -102	"	
R60	" -333	"	
R61	" -332	"	
R62	" -471	"	
R63	" -103	"	
R64	" -103	"	
R65	" -102	"	
R66	QVZ3531-223	VR	3.58 MHz OSC
R67	QRD161J-102	CR	
R68	QRD162J-0R0	"	or QRD161J-0R0
R69	—	—	
R70	—	—	
R71	QRD161J-561	CR	
R72	" -471	"	
R73	" -561	"	
R74	" -154	"	
R75	" -332	"	
R76	" -271	"	
R77	" -102	"	
C 1	—	—	
C 2	—	—	
C 3	—	—	
C 4	—	—	
C 5	—	—	
C 6	QER61CM-476	E Cap	
C 7	PU53610J-153	M Cap	
C 8	QCS31HJ-471	C Cap	
C 9	QER61CM-476	E Cap	
C10	PU53610-103	M Cap	
C11	QER61CM-476	E Cap	
C12	PU53610J-223	M Cap	
C13	—	—	
C14	QCF31HR-223	C Cap	
C15	QER51CM-476	E Cap	
C16	QER61AM-336	"	
C17	PU54070-2	"	
C18	PU54071	"	
C19	PU53610J-103	M Cap	
C20	QEK61CM-476	E Cap	
C21	QCS31HJ-221	C Cap	
C22	" -181	"	
C23	" -680	"	
C24	QEK60JM-476	E Cap	
C25	QCS31HJ-151	C Cap	

Symbol No.	Part No.	Part Name	Recommended Part/ Description
C26	QER61EM-475	E Cap	
C27	QEP61EM-475	E Cap (N.P.)	
C28	" -475	"	
C29	QER51EM-475G	E Cap	
C30	—	—	
C31	QER60JM-107	E Cap	
C32	QEK60JM-336	"	
C33	QER61HM-335G	"	
C34	QER61CM-476	"	
C35	QER51CM-106G	"	
C36	PU53610J-103	M Cap	
C37	QEK61CM-476	E Cap	
C38	QFN41HJ-103	MY Cap	
C39	PU53610J-822	"	
C40	" -103	"	
C41	QEK61CM-476	E Cap	
C42	QFN31HJ-153	MY Cap	
C43	PU53610J-103	"	
C44	QEK51CM-476	E Cap	
C45	PU53610J-103	MY Cap	
C46	QEK61CM-476	E Cap	
C47	PU53610J-153	MY Cap	
C48	QEU50JM-108	E Cap	
C49	QEK51AM-336	"	
C50	PU53610J-153	MY Cap	
C51	QCF11HP-223	C Cap	
C52	QCF31HP-223	"	
C53	—	—	
C54	QCS31HJ-470	C Cap	
C55	PU53610J-152	MY Cap	
C56	PU53610J-153	"	
C57	" -103	"	
C58	—	—	
C59	QCS31HJ-470	C Cap	
C60	—	—	
C61	—	—	
C62	QFN41HJ-103	MY Cap	
C63	QCS11HJ-330	C Cap	
C64	QCS31HJ-150	"	
C65	—	—	
C66	PU51163-201	C Cap	
C67	QCS31HJ-820	"	
C68	QFN41HJ-102	MY Cap	
C69	QCS11HJ-560	C Cap	
L 1	PU53223-101	P. Coil	
L 2	" -150	"	
L 3	" -101	"	
L 4	" -101	"	
L 5	" -101	"	
L 6	—	—	
L 7	—	—	
L 8	PU53223-101	P. Coil	
L 9	PU53618-101	"	
L10	PU53223-101	"	
L11	" -390	"	
L12	" -101	"	
L13	" -101	"	
L14	PU53618-821	"	
L15	PU53223-101	"	
L16	" -101	"	
L17	" -101	"	
L18	—	—	
L19	—	—	
L20	PU53607-682	P. Coil	

Symbol No.	Part No.	Part Name	Recommended Part/ Description
L21	PU53618-220	P. Coil	
L22	PU53223-680	"	
LPF 1	PU53230	L.P.F.	
LPF 2	PU53231	"	
LPF 3	PU53232	"	
LPF 4	PU53233-3	"	
BPF 1	PU53234-2	B.P.F.	
BPF 2	PU52648	"	
DL 1	PU53236A	Delay Line	
DL 2	PU53237A	Comb Filter	
EQ 1	PU53224	Equalizer	
EQ 2	PU53225	"	
EQ 3	PU53226	"	
EQ 4	PU53227-2	"	
EQ 5	PU53228-2	"	
EQ 6	PU53229	"	
⚠	PU53611	RF Converter	
	PU50356-8	Cap. Housing	
	" -14	"	
	PU53238	IC Socket	(2.54 mm PITCH)
	PU53239	"	(1.8 mm PITCH)
	PU53460	Test Point	
	PU53173	Supporter	
	PU53174	Terminal	
	PU53174-2	"	
	SSSP2608Z	Screw	
	WLS2600N	Lock Washer	
	NNNS2600N	Nut	

8.2.3 Pre Amp P.W.B. Ass'y $\boxed{0}\boxed{3}$ . . . PU33584A-2-C

Symbol No.	Part No.	Part Name	Recommended Part/ Description
IC 1	MC5340	Integrated Circuit	
Q 1	2SD602R	Transistor	
Q 2	"	"	
Q 3	"	"	
Q 4	2SC2716Y	"	
Q 5	"	"	
R 1	QRS188J-100YN	Chip R	
R 2	" -100YN	"	
R 3	" -272YN	"	
R 4	" -272YN	"	
R 5	" -331YN	"	
R 6	" -3R9YN	"	
R 7	" -272YN	"	
R 8	QVZ3604-102	VR	CH-2 Q
R 9	" -102	"	CH-1 Q
R10	QRS188J-821YN	Chip R	
R11	" -821YN	"	
J 1	QRS188J-0R0Y	Chip R	
J 2	" -0R0Y	"	
J 3	" -0R0Y	"	
J 4	" -0R0Y	"	
C 1	QEK51HM-105MG	E Cap	
C 2	QCY81HK-223	Chip Cap	
C 3	" -223	"	
C 4	" -223	"	
C 5	QCY81HJ-270	"	
C 6	" -270	"	
C 7	QAT3001-044	T Cap	CH-1 F_0
C 8	" -044	"	CH-2 F_0
C 9	QEK51CM-476M	E Cap	
C10	" -476	"	
L 1	PU53223-101G	Coil	
	PU53320	Shield Case	
	PU53587-8	Cap. Housing	

8.2.4 Audio P.W.B. Ass'y $\boxed{0}\boxed{4}$ PU21411A-M

Symbol No.	Part No.	Part Name	Recommended Part/ Description
IC 1	AN6394	Integrated Circuit	
IC 2	3VT01	"	
IC 3	5VT04	"	
Q 1	2SB788STU	Transistor	
Q 2	2SD661STU	"	
D 1	1SS133Y	Diode	
R 1	QVZ3531-333	VR	E-E LEVEL
R 2	QRD161J-332	CR	
R 3	" -562	"	
R 4	QVZ3531-103	VR	REC LEVEL
R 5	QRD161J-562	CR	
R 6	" -222	"	
R 7	" -333	"	
R 8	" -222	"	
R 9	" -822	"	
R10	" -103	"	
R11	" -223	"	
R12	" -271	"	
R13	" -124	"	
R14	" -472	"	
R15	QVZ3531-333	VR	CANCEL
R16	QRD161J-151	CR	
R17	" -103	"	
R18	" -472	"	
R19	" -100	"	
R20	" -273	"	
R21	QVZ3531-333	VR	BIAS LEVEL
R22	QRD161J-103	CR	
R23	" -103	"	
R24	" -332	"	
R25	" -153	"	
R26	" -105	"	
R27	" -224	"	
R28	QVZ3531-225	VR	PB LEVEL
C 1	QFN31HK-122	MY Cap	
C 2	QEK60JM-226	E Cap	
C 3	QEK61EM-335	"	
C 4	" -335	"	
C 5	" -335	"	
C 6	QEK61HM-474	"	
C 7	QFN31HJ-103	MY Cap	
C 8	" -562	"	
C 9	QEK61EM-335	E Cap	
C10	" -335	"	
C11	" -335	"	
C12	QEK61CM-106	"	
C13	" -226	"	
C14	" -106	"	
C15	QEK60JM-226	"	
C16	QEK61AM-336	"	
C17	QEK61CM-106	"	
C18	" -106	"	
C19	QFN31HJ-223	MY Cap	

Symbol No.	Part No.	Part Name	Recommended Part/ Description
C20	QEK61EM-335	E Cap	
C21	QEK61CM-106	"	
C22	QEK61HM-225	"	
C23	" -474	"	
C24	QEK61CM-106	"	
C25	" -106	"	
C26	" -106	"	
C27	QFN31HJ-681	MY Cap	
C28	" -471	"	
C29	QFP42AG-273M	P Cap	
C30	QEK61CM-106	E Cap	
C31	QEK61AM-336	"	
C32	QFN31HJ-823	MY Cap	
L 1	PU53615	L.P.F.	
L 2	PU53616	EQ Coil	
L 3	PU53606-102	Coil	
L 4	PU53617	Osc. Coil	
	PU53460	Test Pin	TP1—5
CN 1	PU49215-3	Cap. Housing	
CN 2	" -3Y	"	
CN 3	" -2	"	
CN 4	PU53587-2	"	
CN 5	PU50356-10	"	
	QWY122-0.2	VAS Wire	B1—B9

3.2.5 Mechanism Control P.W.B. Ass'y 0 5 PU21406A-3-C

Symbol No.	Part No.	Part Name	Recommended Part/ Description
IC 1	HD44820A72	Integrated Circuit	
IC 2	UPC277G	"	
IC 3	UPC177G	"	
IC 4	UPC277G	"	
IC 5	LC4011BM	"	
IC 6	M54576FP	"	
IC 7	"	"	
IC 8	"	"	
Q 1	2SD601Q,R,S	Transistor	
Q 2	"	"	
Q 3	"	"	
D 1	TLUR143-DE	L.E.D.	REC
D 2	"	"	DUB
D 3	"	"	PLAY
D 4	"	"	PAUSE
D 5	"	"	STOP
D 6	"	"	FF
D 7	"	"	REW
D 8	"	"	BATT
D 9	"	"	DEW
D10	"	"	POWER
D11	MA151WA	Diode	
D12	"	"	
D13	MA151WK	"	
D14	MA151WA	"	
D15	10E2FA8	"	
D16	MA151WA	"	
D17	"	"	
D18	"	"	
D19	MA151WK	"	
D20	"	"	
D21	MA151WA	"	
D22	MA151WK	"	
D23	MA151WA	"	
D24	"	"	
R 1	QRS188J-103YN	Chip R	
R 2	" -103YN	"	
R 3	" -0R0YN	"	
R 4	" -221YN	"	
R 5	" -473YN	"	
R 6	—	—	
R 7	QRS188J-181YN	Chip R	
R 8	" -472YN	"	
R 9	" -472YN	"	
R10	" -120YN	"	
R11	" -472YN	"	
R12	" -472YN	"	
R13	" -223YN	"	
R14	" -223YN	"	
R15	" -562YN	"	
R16	" -104YN	"	
R17	" -124YN	"	
R18	" -563YN	"	
R19	" -273YN	"	
R20	—	—	
R21	QRS188J-271YN	Chip R	
R22	" -332YN	"	

Symbol No.	Part No.	Part Name	Recommended Part/ Description
R23	QRS188J-333YN	Chip R	
R24	QVZ3531-104	VR	BATT. ALARM
R25	QRS188J-223YN	Chip R	
R26	—	—	
R27	—	—	
R28	QRS188J-123YN	Chip R	
R29	" -221YN	"	
R30	—	—	
R31	QRS188J-223YN	Chip R	
R32	QVZ3531-104	VR	BATT. STOP
R33	QRS188J-103YN	Chip R	
R34	" -104YN	"	
R35	—	—	
R36	QRS188J-332YN	Chip R	
R37	QRD163J-332	"	
R38	QRS188J-332YN	"	
R39	" -273YN	"	
R40	" -332YN	"	
R41	QVZ3531-474	VR	REEL MOTOR
R42	QRS188J-332YN	Chip R	
R43	" -223YN	"	
R44	" -223YN	"	
R45	" -681YN	"	
R46	" -271YN	"	
R47	" -271YN	"	
R48	" -103YN	"	
R49	" -103YN	"	
R50	—	—	
R51	QRS188J-103YN	Chip R	
R52	" -183YN	"	
R53	" -473YN	"	
R54	" -224YN	"	
R55	" -333YN	"	
R56	" -223YN	"	
R57	" -224YN	"	
R58	" -473YN	"	
R59	" -223YN	"	
R60	—	—	
R61	QRS188J-223YN	Chip R	
R62	" -473YN	"	
R63	" -104YN	"	
R64	" -104YN	"	
R65	" -224YN	"	
R66	" -221YN	"	
R67	" -103YN	"	
R68	" -393YN	"	
R69	" -103YN	"	
R70	—	—	
R71	QRS188J-473YN	Chip R	
R72	" -473YN	"	
R73	" -473YN	"	
R74	" -271YN	"	
R75	" -103YN	"	
R76	" -333YN	"	
R77	" -332YN	"	
R78	" -473YN	"	
R79	" -223YN	"	
R80	—	—	
R81	QRS188J-223YN	Chip R	
R82	" -224YN	"	
R83	" -105YN	"	
R84	" -223YN	"	
R85	" -223YN	"	
R86	" -332YN	"	
R87	" -103YN	"	

Symbol No.	Part No.	Part Name	Recommended Part/ Description
R88	QRS188J-333YN	Chip R	
R89	—	—	
R90	—	—	
R91	QRS188J-333YN	Chip R	
R92	〃 -223YN	〃	
R93	〃 -563YN	〃	
R94	〃 -333YN	〃	
R95	〃 -223YN	〃	
R96	〃 -101YN	〃	
C 1	QEK50JM-107	E Cap	
C 2	QCF81EZ-104	Chip Cap	
C 3	QEK51CM-226G	E Cap	
C 4	QCF81EZ-224	Chip Cap	
C 5	PU53603	E Cap	
C 6	QEP61EM-475	〃	
C 7	QEK51EM-475G	〃	
C 8	QCY81HK-222	Chip Cap	
C 9	QCS81HJ-471	〃	
C10	QCF81EZ-104	〃	
C11	QEP61EM-475	E Cap	
C12	QFZ9011-104	MY Cap	
C13	QCF81EZ-104	Chip Cap	
C14	QEK61CM-106G	E Cap	
C15	QEK41CM-106	〃	
C16	—	—	
C17	QCF81HZ-103	Chip Cap	
C18	QEK50JM-226G	E Cap	
C19	QEK51CM-106G	〃	
C20	QCY81HK-102	Chip Cap	
C21	QEK51HM-105G	E Cap	
C22	QCY81HK-102	Chip Cap	
C23	QCF81EZ-104	〃	
C24	QCF81HZ-103	〃	
	PU50633	LED Spacer	for D1—D10
RA 1	EXB-LD4103G	Resistor Array	
RA 2	EXB-H84495G	〃	
RA 3	EXB-LD6103G	〃	
RM 1	EXB-UF8302NQ	Resistor Module	
RM 2	〃	〃	
RM 3	〃	〃	
CF 1	PU50224	Ceramic Filter	
S 1	PU53598	Tact Switch	REC
S 2	〃	〃	DUB
S 3	〃	〃	PLAY
S 4	〃	〃	PAUSE
S 5	〃	〃	STOP
S 6	〃	〃	FF
S 7	〃	〃	REW
S 8	PU53599	Push Switch	REC LOCK
S 9	PU53598	Tact Switch	POWER
	PU53600	Jack Ass'y	
	PU53601	Camera Connector	
	LC4052-01-03	Tape Counter	
	PU53602	Jumper	
CN 1	PU50356-20	Recep. Housing	1—20
CN 2	〃 -20	〃	21—40
CN 3	PU49215-3	Cap. Housing	
	SBSE2606Z	Screw	
TP 1	PU53460	Test Pin	

8.2.6 Full Erase Head P.W.B. Ass'y $\boxed{0}\boxed{6}$

Symbol No.	Part No.	Part Name	Recommended Part/ Description
	PU53259	Full Erase Head Board	
IC 1	3VT01	Integrated Circuit	
C 1	QFP42AG-363	P Cap	

8.2.7 Junction P.W.B. Ass'y $\boxed{0}\boxed{8}$ PU33646A-2

Symbol No.	Part No.	Part Name	Recommended Part/ Description
R 1	QRD162J-102	CR	
CN 1	PU49215-2R	Housing	
CN 2	〃 -2	〃	
CN 3	〃 -2Y	〃	
CN 4	〃 -4	〃	
CN 5	〃 -2	〃	
CN 6	〃 -2Y	〃	
CN 7	〃 -2R	〃	
CN 8	〃 -5	〃	
CN 9	〃 -3	〃	
CN10	〃 -2Y	〃	
CN11	〃 -2	〃	
CN12	〃 -2	〃	
CN13	〃 -2	〃	
CN14	〃 -2R	〃	
CN15	PU51945-6	〃	
CN16	〃 -14	〃	
CN17	PU50355-12	〃	

8.2.8 Reel Sensor P.W.B. Ass'y $\boxed{0}\boxed{9}$

Symbol No.	Part No.	Part Name	Recommended Part/ Description
	PU53358	Reel Sensor Board	
	NJL5142ELB-BC	Photo Sensor	
	PU53089	Photo Sensor Case (T)	
	PU53579	〃 (S)	

.2.9 Switching Reg. P.W.B. Ass'y 10 . . . PU53216B

ymbol No.	Part No.	Part Name	Recommended Part/ Description
IC 1	LVC-152-4	Integrated Circuit	
IC 2	MRR-011-4	"	
IC 3	BA6132	IC	
Q 1	2SB744P,Q	Transistor	
D 1	ERB81-004U8A	Schottky Diode	
D 2	ERA81-004U8A	"	
D 3	ERB81-004U8A	"	
D 4	"	"	
D 5	"	"	
R 1	RD22K-J1/8D	CR	
R 2	"	"	
R 3	"	"	
R 4	RD7M-1/8D	"	
R 5	"	"	
R 6	"	"	
R 7	RGS6-FAN-30K	VR 1	5 V ADJ
R 8	"	VR 2	9 V ADJ
C 1	CEE047A25V	MY Cap	
C 2	"	"	
C 3	CEE101A25V	E Cap	
C 4	"	"	
C 5	CEE101A10V	"	
C 6	"	"	
C 7	"	"	
C 8	"	"	
C 9	CEE331A10V	MY Cap	
C10	CEE101A10V	E Cap	
C11	"	"	
C12	"	"	
C13	"	"	
C14	"	"	
C15	"	"	
C16	"	"	
C17	CEE109A50V	MY Cap	
C18	"	"	
C19	CPS102A50J	"	
C20	GR42-6Y5V104Z50	Chip Cap	
C21	–	–	
C22	GR42-6Y5V104Z50	Chip Cap	
C23	"	"	
C24	HE50SJ-YF472Z	C Cap	
C25	"	"	
C26	"	"	
C27	GR42-6Y5V104Z50	Chip Cap	
C28	HE50SJ-YF102Z	C Cap	
C29	GR42-6Y5V104Z50	Chip Cap	
L 1	68-0177	Choke Coil	
L 2	"	"	
L 3	FS1012-221KR32	"	
L 4	68-0175	"	
L 5	FS0810-331K	"	
L 6	68-0175	"	
L 7	FS1012-391KK23	"	
L 8	FS1012-391KK23	Choke Coil	
L 9	"	"	
CN 1	SD-5242-12CHPB	Connector	
	68-0169		
	68-0167		
	68-0166		

8.2.10 End Sensor P.W.B. Ass'y 11

Symbol No.	Part No.	Part Name	Recommended Part/ Description
	PU53356	End Sensor Board	
	TPS605	Photo Transistor	

8.2.11 LED P.W.B. Ass'y 12

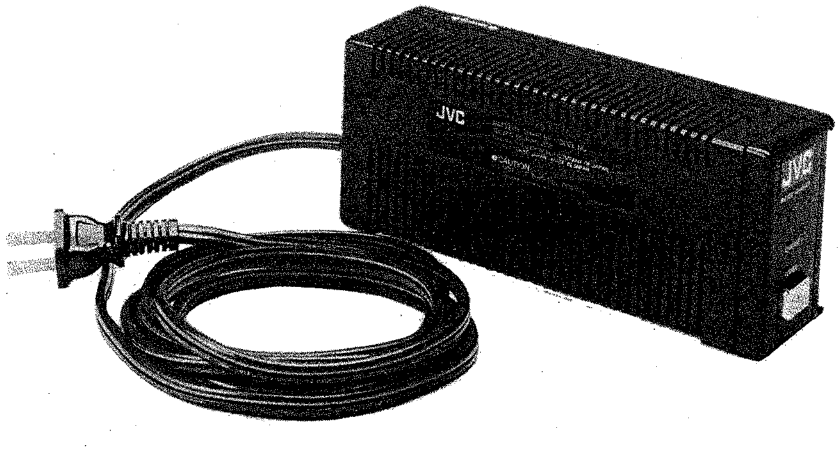
Symbol No.	Part No.	Part Name	Recommended Part/ Description
	PU53357	LED Board	
	TLN107	LED	
	PU53313	LED Holder	

8.2.12 REMOTE CONTROL UNIT P.W.B ASS'Y

Symbol No.	Part No.	Part Name	Recommended Part/ Description
	PU33697-121	Remote Control P.W.B Ass'y	
	PU53598	Tact SW	QTY 7
RA 1	PU33697-200	Resistor Array	
C 1	PU33697-201	MY CAP	
R 1	QRD181J-103A	Resistor	
R 2	" -183A	"	
R 3	Q " -473A	"	

No. 8245 (2/4)

JVC Service Manual



MODEL BB-P3U

JVC COMPANY OF AMERICA

Head office : 41 Slater Drive, Elmwood Park, New Jersey 07407 (201)794-3900
(East Coast)
Midwest : 2250 Lively Boulevard Elk Grove, Illinois 60007 (312)364-9300
Southwest : 3400 South Loop East, Houston, Texas 77021 (713)741-9470
West Coast : 1011 West Artesia Blvd. Compton, Californis 90220 (213)537-6020

JVC CANADA INC.

Subsidiary of Victor Company of Japan, Limited.

Head office : 21 Finchdene Square Scarborough, Ontario M1X 1A7 (416)293-1311

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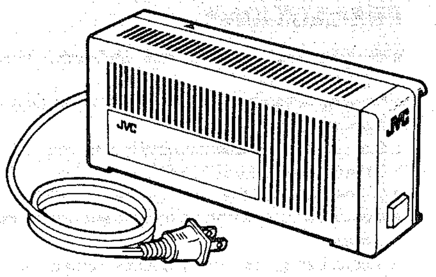
INSTRUCTIONS **JVC**®

BB-P3

BATTERY CHARGER

Specifically for the BB-P3U



For Customer Use:

Enter below the Serial No. which is located on the side of the unit. Retain this information for future reference.

Model No. BB-P3U

Serial No.

PU30425-488

JVC®

JVC Company of America

JL 2 U Printed in Japan
PU30425-488

Thank you for purchasing the JVC BB-P3U Battery Charger. The BB-P3U is for use exclusively with the NB-P3U and NB-P4U battery packs which power the JVC HR-C3 Compact Video Cassette Recorder. To avoid problems and obtain the best results, please read this instruction booklet carefully before use.

CAUTION
RISK OF ELECTRIC SHOCK
DO NOT OPEN

CAUTION: TO REDUCE THE RISK OF ELECTRIC SHOCK,
DO NOT REMOVE COVER (OR BACK).
NO USER-SERVICEABLE PARTS INSIDE.
REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.

The lightning flash with arrowhead symbol, within an equilateral triangle, is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.

The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

WARNING:
TO PREVENT FIRE OR SHOCK HAZARD, DO NOT EXPOSE THIS UNIT TO RAIN OR MOISTURE.

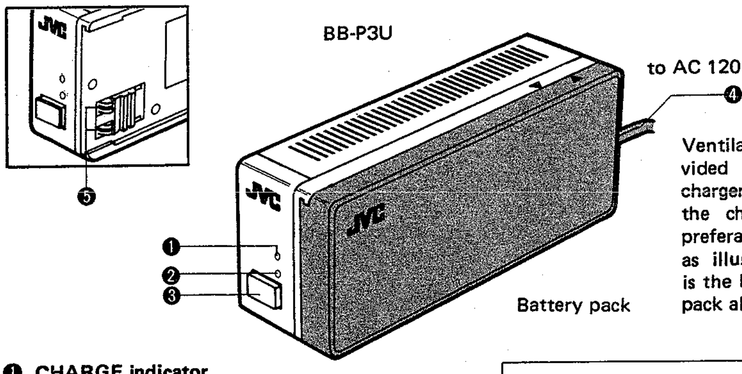
This unit should be used with AC 120 – 240 V, 50/60 Hz only.
CAUTION:
To prevent electric shocks and fire hazards, do NOT use any other power source.

NOTE:
The rating plate (Serial number plate) is on the side of the unit.

PRECAUTIONS

- If used near a radio, this unit may interfere with reception.
- Prevent inflammables, water and metallic objects from entering the unit.
- Do not disassemble or modify the unit.
- Do not apply shocks to the unit.
- Do not subject the unit to direct sunlight.
- Avoid using the unit in extremely hot or humid places.
- Avoid using the unit in places subject to vibrations.

IDENTIFICATION



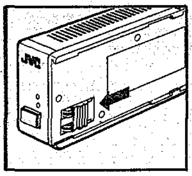
Ventilation holes are provided on the side of the charger. While charging, keep the charger well ventilated preferably by standing it up as illustrated. (Shown here is the BB-P3U with a battery pack already installed.)

① **CHARGE indicator**
Remains lighted during charging and goes off when charging is completed.
② **POWER indicator**
Lights when the POWER button is pressed to ON.
③ **POWER button**
Charging starts when this button is pressed to ON.
④ **AC power cord**
⑤ **Terminals**

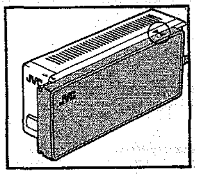
Charging time
NB-P3U: Approx. 60 minutes
NB-P4U: Approx. 90 minutes
- The charging time differs depending on the ambient temperature and the condition of the battery pack.

OPERATION

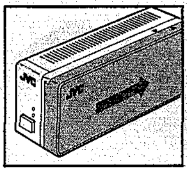
CAUTION: When sliding the battery pack on and off the charger, make sure that the charger's POWER switch is set to OFF.



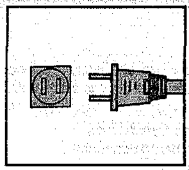
The terminals on the charger are covered by the terminal cover which is automatically opened and closed by sliding the battery pack on and off the charger. If the terminal is out of place and the terminals are exposed, attaching the battery pack is impossible. Slide the cover in the direction of the arrow, if necessary.



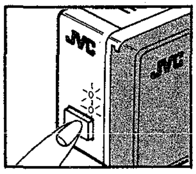
1. Align the marks.



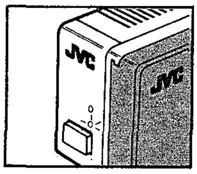
2. Slide the battery pack in the direction of the arrow until it locks in place.



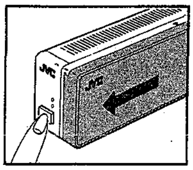
3. Connect the AC power cord to a wall outlet.



4. Press the POWER button to ON.
   The POWER indicator will light first, then the CHARGE indicator will light in a few seconds.



5. When charging is completed, the CHARGE indicator goes off.
   - Faint oscillations may be heard at the start of charging. This is not due to any defect of the unit.

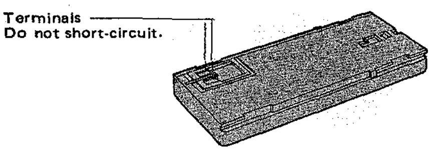


6. Press the POWER button to OFF and remove the battery pack by sliding it off.
   - The battery pack becomes warm immediately after being charged. This is not due to any defect of the unit.

CAUTION
- Short-circuited terminals are very dangerous. After removing the battery pack, check to be sure that the terminals are not exposed.
- *If the POWER button is left in its ON position after the CHARGE indicator goes off,* additional charging continues with a small amount of current.

A WORD ON THE EXCLUSIVE NB-P3U/NB-P4U BATTERY PACKS

The NB-P3U/NB-P4U are nickel-cadmium batteries. Give attention to the following to make the most of their characteristics.



Temperature ranges:
The recharging time is based on room temperature of 20°C (68°F) with a power supply of 120 V. The lower the temperature, the longer the recharging time.

For charging:	10°C to 35°C (50°F – 95°F)
For operating:	-10°C to 40°C (14°F – 104°F)
For storing:	-10°C to 30°C (14°F – 86°F)

For safety, the battery pack has been kept in the uncharged state for shipment. Therefore, before use, charge it.

- **Avoid repeated charging.**
  Charging the battery pack repeatedly without using it may cause over-charging and shorten its service life.
- **Recharge using only a specified charger at 10°C to 35°C (50°F to 95°F).**
  Especially avoid recharging in a place under 10°C (50°F), as it may cause over-charging.
- **After use, store in a discharged condition.**
- ***Do not store in places of high temperatures.***
  Choose a dry place with temperatures between -10° C (14°F) and 30°C (86°F) for optimum storage.
- **The battery pack becomes warm immediately after being charged. This is not due to any defect.**

Caution

The terminals are exposed on the bottom of the battery pack. DO NOT short-circuit these terminals.

- If they are shorted, a great amount of current flows. This is not only very dangerous, but also makes the battery pack unusable.
- When transporting or storing the battery pack, exercise special care so that no metallic object touches the terminals.
- Always keep the terminals clean. If they become dirty, wipe them with a piece of soft cloth.

BB-P3U SPECIFICATIONS

Charging system : Constant current, peak detection, timer controlled.
Power supply : 120 – 240 V AC∿, 50/60 Hz
Power consumption : 20 watts
Dimensions : 57(W) x 74(H) x 182(D) mm
(2-1/4" x 2-15/16" x 7-3/16")
Weight : 550 g (1.22 lbs)

— Battery charger assembly list —

Symbol No.	Part No.	Part Name	Description	Symbol No. Position	Q'ty
⚠ 1	PU53200-501	Front Cover		2-D	1
2	" -514	Charge Control P.W.B. Ass'y		2-C	1
3	" -002	Screw		2-C	3
4	" -003	"		2-C	1
⚠ 5	" -004	Power Switch		2-C	1
6	" -005	Switch Button		3-C	1
7	" -006	Screw		3-C	2
⚠ 8	" -502	Top Cover Ass'y	Incl.⑨	1-B	1
⚠ 9	" -503	Rating Plate		1-B	1
10	—	—		—	—
11	PU53200-010	Heat Sink B.		2-B	1
12	" -012	Screw		2-A, 2-B	4
13	" -513	Regulator P.W.B. Ass'y		3-B	1
14	" -003	Screw		3-B	1
⚠ 15	" -504	Fuse		3-A, 3-B	3
16	" -013	Terminal Plate		4-C	1
17	" -014	Terminal Cover		5-B	1
18	" -015	Charging Terminals		4-C	1
19	" -016	Shorting Plate		3-B	1
20	" -017	Shorting Spring		3-B	1
21	" -003	Screw		4-C	2
⚠ 22	" -505	Power Cord Ass'y		2-A	1
23	" -019	Tube B.		3-A	1
24	" -020	" A.		4-B	1
⚠ 25	" -506	Shield Cover		4-B	1
26	" -515	Fuse Replacement Label		4-A	1
⚠ 27	" -507	Insulator Plate		4-B	1
⚠ 28	" -508	Battery Holder Ass'y	Incl. ㉙, ㉚	5-C	1
29	" -509	Caution Label		5-C	1
30	" -025	Position Sticker		5-B	1
31	" -026	Screw		5-A	4
32	" -027	"		5-C	1

SECTION 5
ELECTRICAL PARTS LIST

5.1 Regulator P.W.B. Ass'y

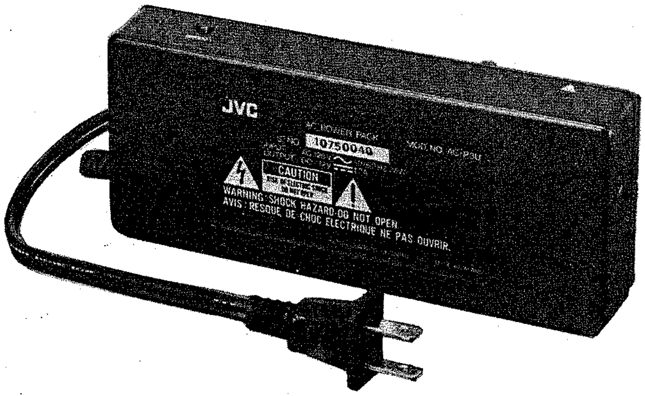
Symbol No.	Part No.	Part Name	Recommended Part/ Description
	PU53200-513	Regulator P.W.B. Ass'y	
IC 1	AN6780	Timer IC	
IC 2	–	–	
IC 3	EHMJ11L96	Control IC	
Q 1	2SC3260	Transistor	
Q 2	–	–	
Q 3	–	–	
Q 4	–	–	
Q 5	2SA564AQ	Transistor	
Q 6	2SB621AQ	"	
Q 7	2SD886P	"	
Q 8	2SC828AP	"	
Q 9	"	"	
⚠ D 1	SIRBA60	Diode Stack	
D 2	F-114F	Diode	
D 3	VO6C	"	
D 4	"	"	
D 5	"	"	
⚠ D 6	S5KC20	"	
D 7	MA150	"	
D 8	–	–	
D 9	–	–	
D10	RK14	Schottky Diode	
D11	MA1180M	Zener Diode	
D12	MA1051	"	
D13	MA1082	"	
D14	MA1240M	"	
D15	–	–	
D16	–	–	
D17	F-114F	Diode	
D18	RD4.7F	Zener Diode	
⚠ R 1	QRF021K-4R7	Unflammable R	
⚠ R 2	QRG016J-683	OMR	
⚠ R 3	QRC011K-224	Comp. R	
⚠ R 4	QRG016J-680	OMR	
R 5	PU53200-102	Metal Plate R	
R 6	" -102	"	
R 7	–	–	
R 8	–	–	
R 9	–	–	
R10	–	–	
R11	–	–	
R12	QRD143J-562	CR	
⚠ R13	QRX016J-R62	MFR	
R14	QRD143J-471	CR	
R15	" -222	"	
R16	–	–	
⚠ R17	QRG026J-681	OMR	
⚠ R18	QRG029J-680	"	
R19	–	–	
R20	QRD143J-562	CR	
R21	" -562	"	
R22	" -684	"	
⚠ R23	QRG016J-331	OMR	
R24	–	–	
R25	QRD143J-222	CR	
R26	–	–	
R27	QRD143J-150	CR	
⚠ C 1	PU53200-510	Polyester Cap	
⚠ C 2	" -511	"	
⚠ C 3	" -105	"	
⚠ C 4	" -105	"	
C 5	" -106	E Cap	
C 6	" -107	Polyester Cap	
C 7	–	–	
C 8	PU53200-108	C Cap	
C 9	" -109	Polyester Cap	
C10	" -110	E Cap	
C11	–	–	
C12	PU53200-110	E Cap	
C13	" -111	C Cap	
C14	" -512	E Cap	
C15	" -113	"	
C16	" -114	"	
C17	–	–	
C18	–	–	
⚠ C19	PU53200-105	Polyester Cap	
⚠ PHC	PS-2011	Photo Coupler	
⚠ T 1	PU53200-115	Switching Transformer	
⚠ L 1	PU53200-116	Filter Choke Coil	
⚠ F1	PU53200-504	Fuse	(250 V, 2 A MT42A)
⚠	" -118	Fuse clip	
	" -119	Connector	
	PU53200-200	Heat Sink A	
	PU53200-201	Screw	(M3 x 8)
	" -202	"	(M3 x 10)
	" -203	"	(M3 x 6)
	" -204	Washer	
	" -205	Mylar Sheet	for Q1
	" -206	"	for D6
	" -207	Bushing	for "
	PU53200-214	Tube C	for R3

5.2 Charging Control P.W.B. Ass'y

Symbol No.	Part No.	Part Name	Recommended Part/ Description
	PU53200-514	Charging Control P.W.B. Ass'y	
IC 2	BQ-053	Charging Control IC	
D 8	MA26W	Diode	
D 9	MA150	"	
D15	SR531D	LED	
D16	"	"	
R16	QRD143J-222	CR	
R17	—	—	
R18	—	—	
R19	QRD143J-222	CR	
R20	—	—	
R21	—	—	
R22	—	—	
R23	—	—	
R24	QRD143J-105	CR	
R25	—	—	
R26	QRD143J-104	CR	
R27	—	—	
R28	QRD143J-151	CR	
C17	PU53200-216	E Cap	
C18	" -217	"	
C19	—	—	
C20	—	—	
C21	PU53200-218	E Cap	
C22	" -219	C Cap	
C23	" -219	"	

No. 8245 (¾)

JVC Service Manual


JVC
10750040
CAUTION
WARNING: SHOCK HAZARD-DO NOT OPEN
AVIS: RISQUE DE CHOC ELECTRIQUE NE PAS OUVRIR.

MODEL AC-P3U

JVC COMPANY OF AMERICA

Head office (East Coast) : 41 Slater Drive, Elmwood Park, New Jersey 07407 (201)794-3900
Midwest : 2250 Lively Boulevard Elk Grove, Illinois 60007 (312)364-9300
Southwest : 3400 South Loop East, Houston, Texas 77021 (713)741-9470
West Coast : 1011 West Artesia Blvd. Compton, Californis 90220 (213)537-6020

JVC CANADA INC.

Subsidiary of Victor Company of Japan, Limited.

Head office : 21 Finchdene Square Scarborough, Ontario M1X 1A7 (416)293-1311

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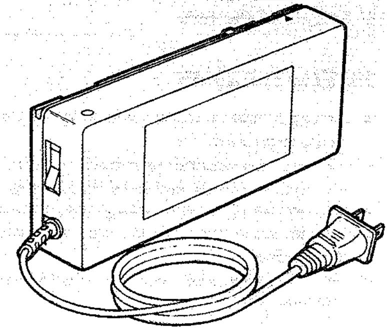
INSTRUCTIONS

JVC®

AC-P3

AC POWER PACK

Specifically for the AC-P3U



For Customer Use:
Enter below the Serial No. which is located on the side of the unit. Retain this information for future reference.

Model No. **AC-P3U**

Serial No. ____________________

PU30425-489

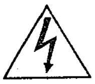
JVC®
JVC Company of America

JL 2 U Printed in Japan
PU30425-489

Thank you for purchasing the JVC AC-P3U AC Power Pack. The AC-P3U is for use exclusively with the JVC HR-C3 Compact Video Cassette Recorder. To avoid problems and obtain the best results, please read this instruction booklet carefully before use.

CAUTION
RISK OF ELECTRIC SHOCK
DO NOT OPEN

CAUTION: TO REDUCE THE RISK OF ELECTRIC SHOCK,
DO NOT REMOVE COVER (OR BACK).
NO USER-SERVICEABLE PARTS INSIDE.
REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.



The lightning flash with arrowhead symbol, within an equilateral triangle, is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.

The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

WARNING:
TO PREVENT FIRE OR SHOCK HAZARD, DO NOT EXPOSE THIS UNIT TO RAIN OR MOISTURE.

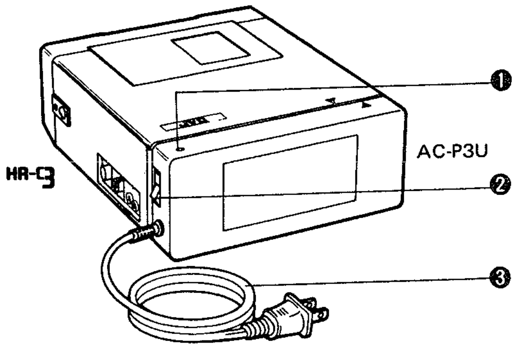
This unit should be used with AC 120 V, 50/60 Hz only.
CAUTION:
To prevent electric shocks and fire hazards, do NOT use any other power source.

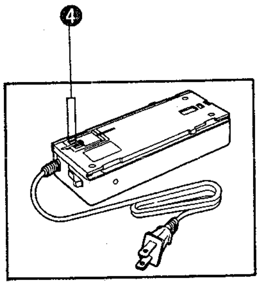
NOTE:
The rating plate (Serial number plate) is on the side of the unit.

PRECAUTIONS

- If used near a radio, this unit may interfere with reception.
- Do not disassemble or modify the unit, as this will cause danger and malfunctioning.
- Do not apply violent shocks to the unit.
- Avoid using the unit in extremely hot or humid places.
- Avoid using the unit in places subject to vibrations.

IDENTIFICATION





❶ **POWER indicator**
Lights red when the POWER switch is set to ON.
❷ **POWER switch**
Set to ON to supply power and to OFF to cut power.
❸ **AC power cord**
❹ **Terminals**

Notes:
- DO NOT short-circuit the terminals when the power cord is plugged in.
- Always keep the terminals clean. If they become dirty, wipe them with a piece of soft cloth.
- After long periods of continuous use, the cabinet of this unit may become warm. This is not due to any defect.

DISASSEMBLY

1.1 OUTER CASE

1. Take out three black screws ⑨.
2. Remove the cover ① by pulling it upward.

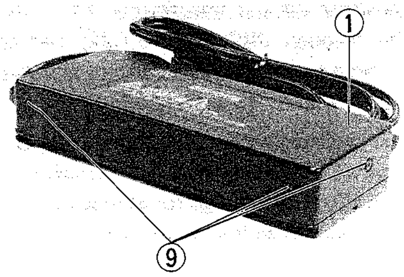


Fig. 1-1 Outer case

1.2 CIRCUIT BOARD

1. Remove the insulating board ②.
2. Take out two screws ⑪.

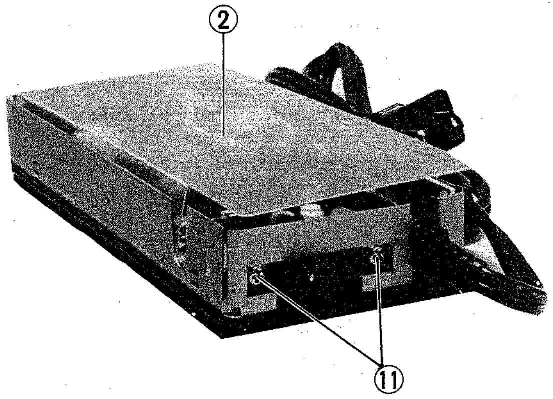


Fig. 1-2 Circuit board (1)

3. Remove the AC cord from the shielding board ⑤.
4. Take out two screws ⑩.
5. Since the print board is held by tabs, pry it free by using a screwdriver or other tools.

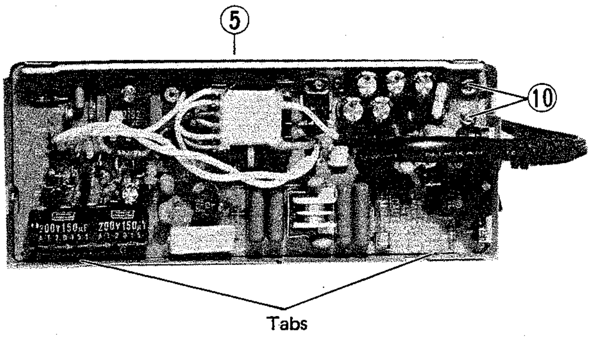


Fig. 1-3 Circuit board (2)

6. As shown in Fig. 1-5, remove the circuit board from the shiel plate ⑤. Use care that the shield board ⑤ does not snag on the power switch.

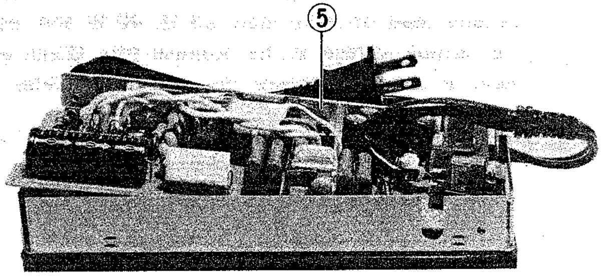


Fig. 1-4 Circuit board (3)

1.3 FRAME

1. Take out three black screws ⑫.

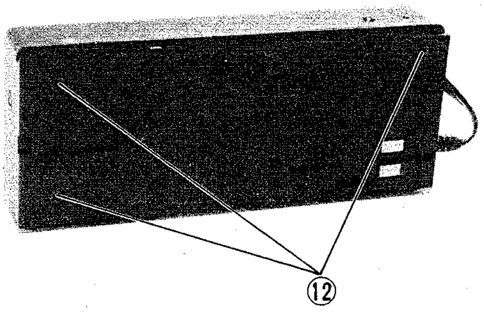


Fig. 1-5 Frame

1.4 PRECAUTIONS DURING REPAIRING

1. Before repairing, confirm that the voltage at both ends of capacitor C11 is lower than 30 V after the power switch is turned off.
2. Confirm that fuse resistors R4 and R16 are not open.

SECTION 2
ADJUSTMENT

.1 OUTPUT VOLTAGE ADJUSTMENT

Connect a DC voltmeter to the output and adjust the variable resistor to set the output at 12.2 V. (Apply a dummy load of more than 8.3 Ω, 40 W and measure the output voltage at the terminal side. Quick adjustment is required because the load accumulates heat.)

Note: Do not allow the output voltage to exceed 12.3 V.

SECTION 3
CIRCUIT OPERATION

3.1 GENERAL DESCRIPTION

1. AC line voltage goes via the switch and fuse to the input filter, then to the rectifier. The resulting DC voltage is converted into approximately 30 kHz (at rated load) AC by transistor Q4 and transformer T1. This is again rectified by through CR9, C17 to C22, and chokes L4 and L5 to become a 12 V DC output. The red LED lights when power is activated.

   Variable resistor R18 adjusts the output voltage. Care must be taken that this does not exceed 12.3 V in order to avoid possible damage to connected equipment (perform adjustment at the rated current).

2. While output current is low, Q4 base current becomes supplied from R9 and C15. AC produced at the base winding of T1 is rectified at CR6 and controlled so that the voltage at both ends of C16 becomes approximately 5.6 V (which is the zener voltage of CR5).

   When the output current increases, the Q4 base current from only R9 and C15 becomes insufficient, and the output voltage tends to decline. The decline is detected by the output voltage detector and corresponding data are sent via photocoupler IC1 to the primary side. Additional base current is then supplied to Q4 from R4 and Q1 to prevent output voltage decline.

3. In event of overcurrent, the voltage at both ends of R14 increases. Q2 and Q3 switch on to absorb the Q4 base current.

   When the output voltage declines to approximately 7 V (IC1 diode VF + CR10 zener voltage), Q1 switches off. This reduces Q4 base current.

— AC Power pack assembly list —

Symbol No.	Part No.	Part Name	Description	Symbol No. Position	Q'ty
1	PU53217-019	Cover		5-A	1
⚠ 2	〃 -002	Insulator		3-C	1
3	—	Circuit Board Assembly	See Sec. 6.	3-C	1
⚠ 4	PU53217-003	Insulator		2-C	1
⚠ 5	〃 -004	Shield Plate		2-A	1
⚠ 6	〃 -005	Frame		2-A	1
⚠ 7	〃 -020	Power Cord		3-C	1
8	〃 -007	Contact Shoe		3-B	1
9	〃 -008	Screw		4-A	1
10	〃 -009	〃		4-B	1
11	〃 -010	〃		3-A	1
12	〃 -011	〃		1-C	1
13	〃 -012	Label		2-A	1
⚠ 14	〃 -021	〃		5-C	1
15	〃 -022	〃		3-C	1
16	〃 -023	〃		2-C	1
17	〃 -024	〃		1-B	1

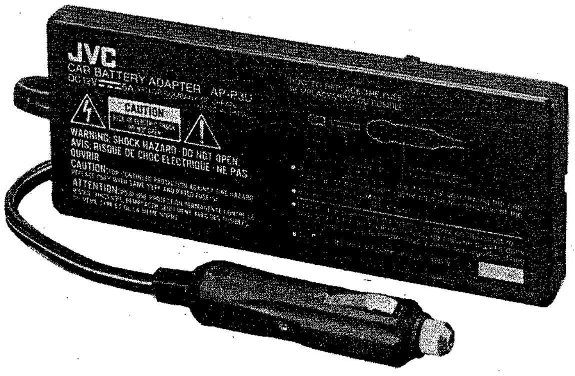
SECTION 6
ELECTRICAL PARTS LIST

C Power Pack P.W.B. Ass'y

Symbol No.	Part No.	Part Name	Recommended Parts/ Description
IC 1	TLP531GR	Integrated Circuit	
Q 1	2SC2655Y	Transistor	
Q 2	2SC945Q	"	
Q 3	2SA1020Y	"	
Q 4	2SC2792	"	
Q 5	2SC945Q	"	
Q 6	"	"	
CR 1	W04	Diode	
CR 2	RGP10J	"	
CR 2	RGP10K	"	
CR 4	1SS118	"	
CR 5	RD5.6FB2	Zener Diode	
CR 6	1SS118	Diode	
CR 7	—	—	
CR 8	1S118	Diode	
CR 9	ESAB82-004	"	
CR10	RD5.1EB2	Zener Diode	
CR11	TLR106	LED	
⚠R 1	PU53217-139	Flameproof R	1.5
R 2	" -103	CR	330 K
R 3	" -104	"	1 M
⚠R 4	" -105	FR	2.7
R 5	" -106	CR	56
R 6	" -107	"	33
R 7	—	—	
R 8	PU53127-108	CR	220
R 9	" -109	"	39
R10	" -110	"	1 K
R11	" -111	"	820
R12	" -112	"	470
R13	" -107	"	33
⚠R14	" -140	MFR	0.27
R15	—	—	
⚠R16	PU53217-114	FR	3.9
R17	" -115	CR	5.6 K
R18	" -116	VR	2 K (12 V ADJ)
R19	" -117	CR	1.8 K
R20	" -118	"	100
R21	" -112	"	470
R22	" -110	"	1 K
R23	" -110	"	1 K
R24	" -110	"	1 K
R25	" -119	"	15
R26	" -110	"	1 K
⚠C 1	PU53217-141	MY Cap	0.047/125 V
⚠C 2	" -142	"	0.047/125 V
⚠C 3	" -121	C Cap	0.001/125 V
⚠C 4	" -121	"	0.001/125 V
⚠C 5	" -143	MY Cap	0.047/125 V
C 6	" -144	"	0.047/125 V
C 7	—	—	
C 8	—	—	
⚠C 9	PU53217-121	C Cap	0.001/125 V
⚠C10	" -121	"	0.001/125 V
⚠C11	" -122	E Cap	150/200 V
C12	PU53217-123	MY Cap	0.001/600 V
C13	" -124	MM Cap	0.01/630 V
C14	" -125	C Cap	220 P/1 KV
C15	" -126	MY Cap	0.022/50 V
C16	" -127	E Cap	100/25 V
C17	" -128	"	220/25 V
C18	" -128	"	220/25 V
C19	" -128	"	220/25 V
C20	" -128	"	220/25 V
C21	" -128	"	220/25 V
C22	" -129	MY Cap	0.1/50 V
⚠L 1	PU53217-130	Choke Coil	10 mH
L 2	" -131	"	15 μH
L 3	" -131	"	15 μH
L 4	" -132	"	3 μH
L 5	" -133	"	108 μH
⚠T 1	PU53217-134	Transformer	
⚠F 1	PU53217-145	Fuse	
⚠	" -136	Fuse Clip	
⚠SW 1	PU53217-146	Switch	POWER Switch
	" -138	Tube	
	PU53217-147	Heat Sink	
	PU53217-154	Screw	
	" -148	Insulator	for Q 4
	" -149	Bushing	"
	" -150	Screw	"
	WSB3000N	Washer	"
	WLS3000N	Lock Washer	"
	NNB3000N	Nut	"
	PU53217-151	Insulator	for CR9
	" -152	Bushing	"
	" -153	Plate	"
	WLS3000N	Lock Washer	"
	NNB3000N	Nut	"
	PU53217-150	Screw	"

No. 8245 (4/4)

JVC Service Manual


JVC
CAR BATTERY ADAPTER AP-P3U
CAUTION
WARNING: SHOCK HAZARD - DO NOT OPEN.
AVIS: RISQUE DE CHOC ELECTRIQUE - NE PAS OUVRIR
CAUTION:
ATTENTION:

MODEL AP-P3U

JVC COMPANY OF AMERICA

Head office (East Coast)	: 41 Slater Drive, Elmwood Park, New Jersey 07407	(201)794-3900
Midwest	: 2250 Lively Boulevard Elk Grove, Illinois 60007	(312)364-9300
Southwest	: 3400 South Loop East, Houston, Texas 77021	(713)741-9470
West Coast	: 1011 West Artesia Blvd. Compton, Californis 90220	(213)537-6020

JVC CANADA INC.

Subsidiary of Victor Company of Japan, Limited.

Head office : 21 Finchdene Square Scarborough, Ontario M1X 1A7 (416)293-1311

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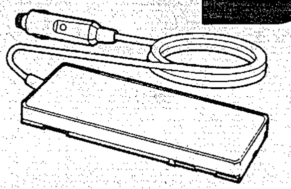
INSTRUCTIONS

JVC®

AP-P3

CAR BATTERY ADAPTER

Specifically for the AP-P3U



PU30425-490

JVC®
JVC Company of America

JL2 U
Printed in Japan
PU30425-490

Thank you for purchasing the JVC AP-P3U Car Battery Adapter. The AP-P3U is for use exclusively with the JVC HR-C3 Compact Video Cassette Recorder. To avoid problems and obtain the best results, please read this instruction booklet carefully before use.

CAUTION
RISK OF ELECTRIC SHOCK
DO NOT OPEN

CAUTION: TO REDUCE THE RISK OF ELECTRIC SHOCK,
DO NOT REMOVE COVER (OR BACK).
NO USER-SERVICEABLE PARTS INSIDE.
REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.

The lightning flash with arrowhead symbol, within an equilateral triangle, is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.

The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

WARNING:
TO PREVENT FIRE OR SHOCK HAZARD, DO NOT EXPOSE THIS UNIT TO RAIN OR MOISTURE.

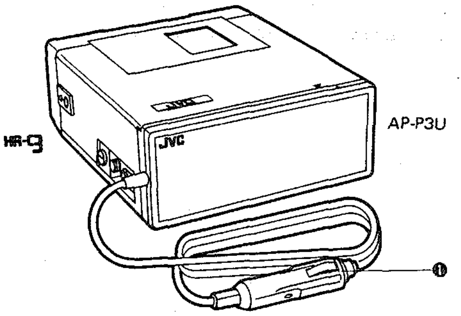
This unit should be used with 12 V DC only.
CAUTION:
To prevent electric shocks and fire hazards, do NOT use any other power source.

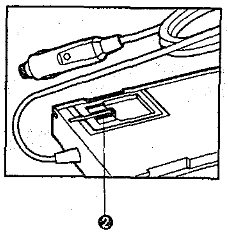
NOTE:
The rating plate is on the bottom of the unit.

PRECAUTIONS

- Prevent water from entering the unit.
- Do not disassemble or modify the unit, as this will cause danger and malfunctioning.
- Avoid using the unit in places subject to direct sunlight, excessive humidity and vibrations.

IDENTIFICATION





① **Cigarette lighter plug**
Insert into the cigarette lighter socket of your car.

② **Terminals**

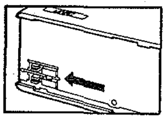
Notes:

- DO NOT short-circuit the terminals when the power cord is plugged in.
- Always keep the terminals clean. If they become dirty, wipe them with a piece of soft cloth.

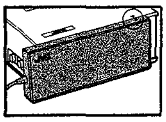
OPERATION

CAUTION:
When sliding the adapter on and off the HR-C3, make sure that the HR-C3's POWER switch is set to OFF.

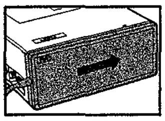
To attach



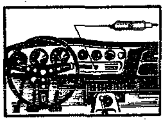
The terminals on the rear of the HR-C3 are covered by the terminal cover, which is automatically opened and closed by sliding the adapter on and off the HR-C3. If the terminal cover is out of place and the terminals are exposed, attaching the adapter is impossible. Slide the cover in the direction of the arrow, if necessary.



1. Align the marks.

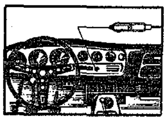


2. Slide in the direction of the arrow until it locks in place.

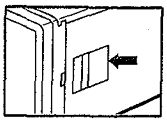


3. Plug into the car's cigarette lighter socket.
   Keep the car engine idling. Pressing the POWER button of the HR-C3 will switch on the power.

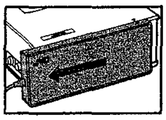
To remove



1. Remove the plug from the cigarette lighter socket.

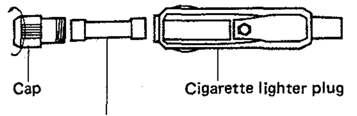


2. While pressing the release button on the HR-C3 . . .



3. . . . slide the adapter off.

HOW TO REPLACE THE FUSE



- When replacing the fuse, take it out by unscrewing the cap at the tip of the cigarette lighter plug in the direction of the arrow (counter-clockwise).
- Always use a 5 A-125 V fuse.

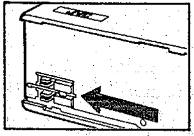
AP-P3U SPECIFICATIONS

Input	: 12 V DC ⎓ (negative-grounded cars only)
Dimensions	: 179(W) x 17(H) x 74(D)mm (7-1/16" x 11/16" x 2-15/16")
Weight	: 300 g (0.67 lb)

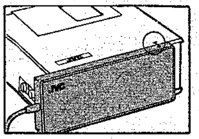
OPERATION

CAUTION: When sliding the power pack on and off the **HR-C3**, make sure that the power pack's POWER switch is set to OFF.

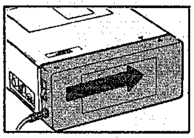
To attach



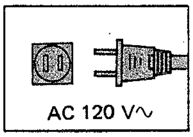
The terminals on the rear of the **HR-C3** are covered by the terminal cover, which is automatically opened and closed by sliding the power pack on and off the **HR-C3**. If the terminal cover is out of place and the terminals are exposed, attaching the power pack is impossible. Slide the cover in the direction of the arrow, if necessary.



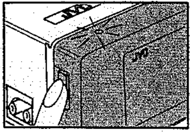
1. Align the marks.



2. Slide the power pack in the direction of the arrow until it locks in place.

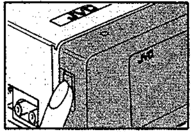


3. Connect the AC power cord to a wall outlet.

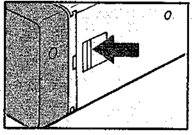


4. Set the POWER switch to ON. The POWER indicator will light, and the **HR-C3** will be powered.

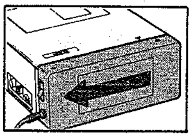
To remove



1. Press the POWER switch to OFF.



2. While pressing the release button on the **HR-C3** . . .



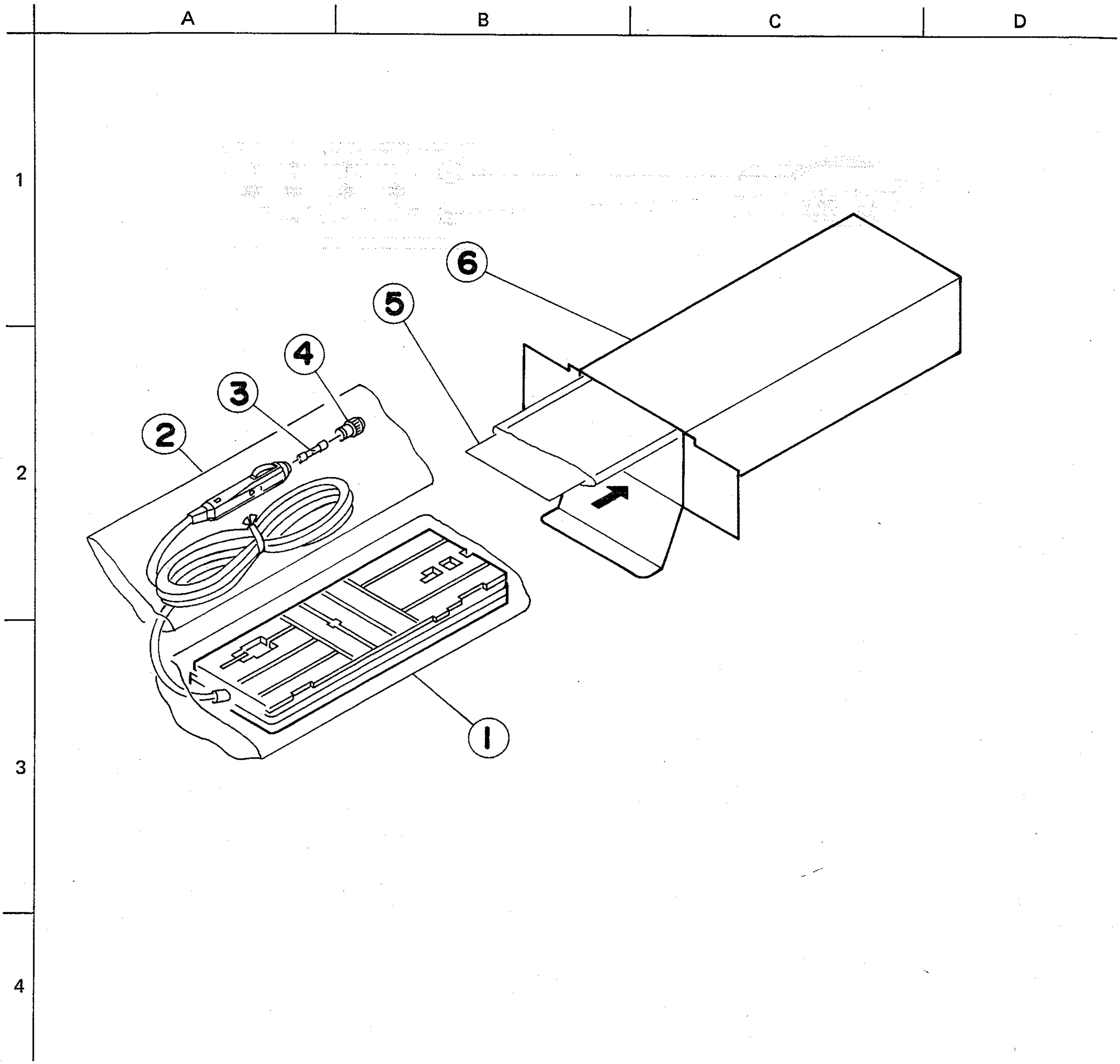
3. . . . slide the power pack off.

AC-P3U SPECIFICATIONS

Output : 12 V DC ⎓ , 1.7 A max.
Power supply : 120 V AC∿, 50/60 Hz
Power consumption : 28 watts
Dimensions : 33(W) x 74(H) x 183(D) mm
(1-5/16" x 2-15/16" x 7-1/4")
Weight : 550 g (1.22 lbs)

EXPLODED VIEW AND PARTS LIST

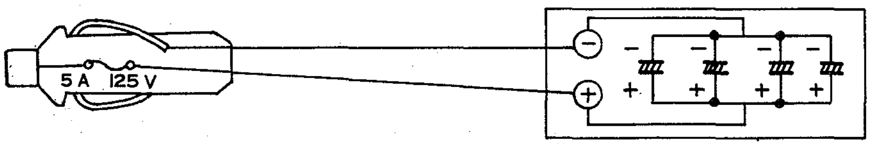
— Packing assembly —



— Packing assembly list —

Symbol No.	Part No.	Part Name	Description	Symbol No. Position	Q'ty
1	QPGA015-02505	Poly Bag		3-B	1
2	QPGA015-02505	"		2-A	1
⚠ 3	QMF61U1-5R0	Fuse	5 A 125 V	2-A	1
4	S-U1010-7	Terminal		2-A	1
⚠ 5	PU30425-490	Instructions		1-B	1
6	X-U1049-02	Packing Case		1-B	1

AP-P3U SCHEMATIC DIAGRAM –



No. 8245(5/5)

JVC Service Manual

VHS
CASSETTE ADAPTER
JVC

MODEL C-P2U

VICTOR COMPANY OF JAPAN, LIMITED

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Printed in Japan

INSTRUCTIONS
MANUEL D'INSTRUCTIONS/BEDIENUNGSANLEITUNG

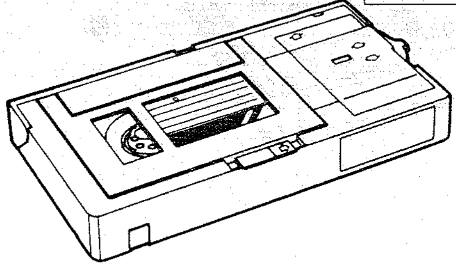
JVC

C-P2

CASSETTE ADAPTER
ADAPTATEUR DE CASSETTE
CASSETTEN-ADAPTER

VHS

Specifically for the C-P2U/S
Spécial pour le C-P2U/S
Bedienungsanleitung für das Modell C-P2U/S



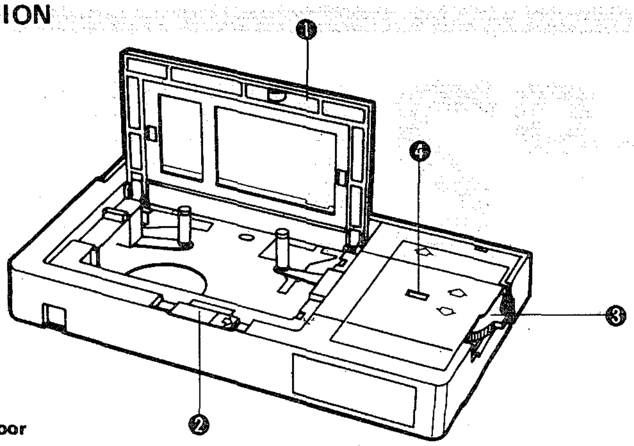
PU30425-515

JVC
VICTOR COMPANY OF JAPAN, LIMITED

OCT2 U/S Printed in Japan
PU30425-515

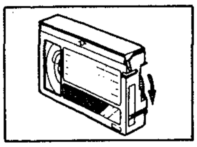
Thank you for purchasing the JVC C-P2U/S VHS Cassette Adapter. This adapter enables a compact video cassette carrying the VHS C mark to be recorded and played back on any video recorder carrying the VHS mark. To avoid problems and obtain the best results, please read this instruction booklet carefully before use.

IDENTIFICATION

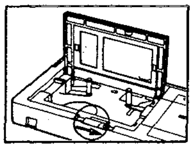


- ① **Compartment door**
- ② **Sliding latch**
- ③ **Loading gear**
- ④ **Loading/Unloading indicator window**

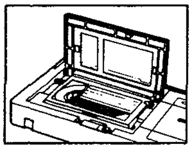
INSERTING A COMPACT VIDEO CASSETTE



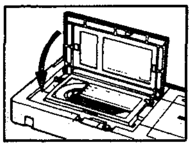
Note:
If there is slack in the video tape when inserting the compact cassette into the adapter, the tape may become damaged. To take up slack in the tape, turn the gear in the direction of the arrow.



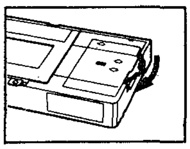
1. Push the sliding latch ② in the direction of the arrow to open the compartment door.



2. Insert the compact video cassette into the adapter as shown in the diagram.

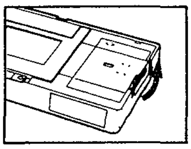


3. Close the compartment door.

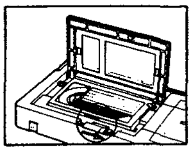


4. Turn the loading gear ③ gently in the direction of the blue LOADING (CHARGER) arrow until the indicator window is completely blue.

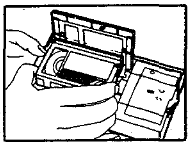
REMOVING THE COMPACT VIDEO CASSETTE



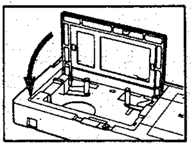
1. Turn the loading gear ③ in the direction of the red UNLOADING (DECHARGER) arrow until the indicator window is completely red.



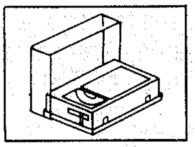
2. Push the sliding latch ② in the direction of the arrow to open the compartment door.



3. Using the smaller hole on the underside of the adapter, push the cassette up from below and remove it.



4. Close the compartment door.



5. Put the compact cassette in its case for storage.

Notes:
- The loading gear cannot be turned without a compact cassette in the compartment.
- Unless the indicator window is completely red, the sliding latch will not move even when pushed.

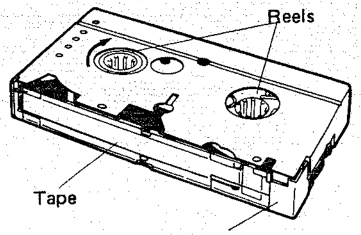
SPECIFICATIONS

Type : VHS cassette adapter
Dimensions : 188(W) x 25(H) x 104(D) mm (7-7/16" x 1" x 4-1/8")
Weight : 205 g (0.45 lb.)

CAUTION

Check the tape condition after inserting the cassette and loading the tape:

1) Check to see if there is any tape slack. (Do not open the tape cover.)
2) If there is tape slack, remove it by turning the reel in the direction of the arrow.



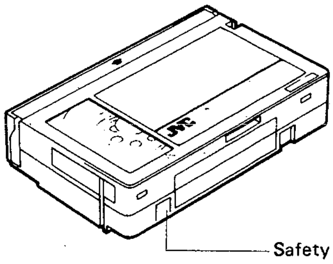
Note
During special-effects playback (slow motion, still frame, etc.) the picture may vibrate or noise bars may appear on the screen.

Design and specifications subject to change without notice.

PRECAUTIONS

- This cassette adapter is precision-manufactured. Avoid violent vibrations or shocks. Do not drop or disassemble or modify it, otherwise malfunctions may result.
- Do not load and unload the cassette adapter repeatedly without allowing the tape to run. This will slacken the tape and thereby damage it.
- The cassette adapter cannot be loaded upside down.
- Do not touch the tape when inserting a compact cassette into this cassette adapter. After use, remove the cassette from the adapter.
- Avoid exposing the cassette to direct sunlight. Keep away from heaters.
- Avoid strong magnetic fields (such as those near TV Sets or Speakers).
- Avoid extreme humidity when selecting a storage location.
- Avoid dusty places.

Compact video cassette



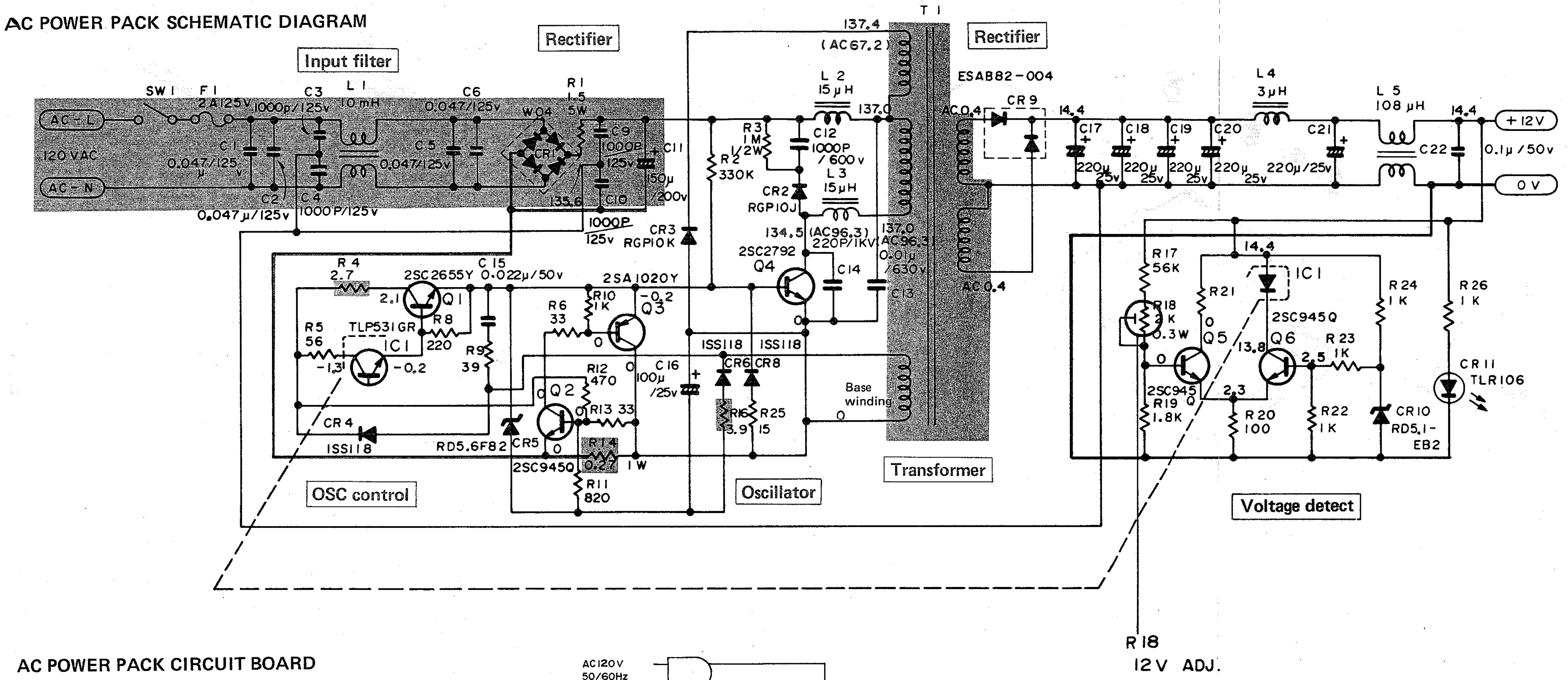
Note:
VHS C compact video cassettes are equipped with a safety tab to prevent accidental erasure. Break and remove this safety tab from not-to-be-erased cassettes. If you install a cassette whose safety tab has been removed into this adapter, recording cannot be performed. If you wish to record on a cassette whose safety tab has been removed, reseal the slot with cellophane tape.

SECTION 4
SCHEMATIC AND CIRCUIT BOARD DIAGRAM

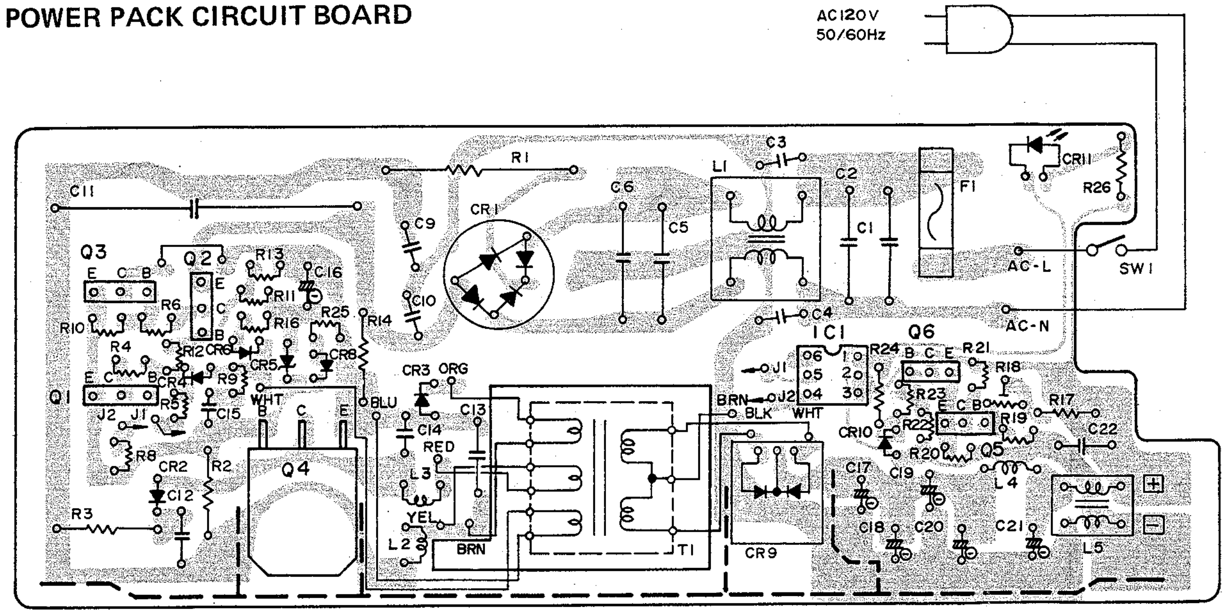
A B C D E F G H

1 2 3 4 5

4.1 AC POWER PACK SCHEMATIC DIAGRAM


Input filter
Rectifier
Rectifier
Transformer
OSC control
Oscillator
Voltage detect
AC-L
AC-N
120 VAC
SW1
F1 2A/125V
C3 1000p/125v
L1 10mH
C6 0.047/125v
C1 0.047/125v
C2 0.047μ/125v
C4 1000P/125v
C5 0.047/125v
W04
CR1
R1 1.5 5W
C9 1000P 125v
C10 1000P 125v
C11 150μ /200v
135.6
137.4 (AC67.2)
T1
R3 1M 1/2W
R2 330K
C12 1000P /600v
L2 15μH
L3 15μH
CR2 RGP10J
CR3 RGP10K
137.0
134.5 (AC96.3) 220P/1KV
137.0 AC96.3 0.01μ /630v
C13
C14
2SC2792 Q4
Base winding
ISS118 CR6
ISS118 CR8
R16 3.9
R25 15
C16 100μ /25v
R4 2.7
2SC2655Y Q1
C15 0.022μ/50v
2SA1020Y Q3
-0.2
2.1
R5 56
TLP531GR IC1
-1.3
-0.2
R8 220
R9 39
R6 33
R10 1K
R12 470
R13 33
R14 0.27 1W
R11 820
2SC945Q Q2
CR5 RD5.6F82
CR4 ISS118
ESAB82-004
AC0.4
CR9
AC0.4
14.4
C17 220μ 25v
C18 220μ 25v
C19 220μ 25v
C20 220μ 25v
L4 3μH
C21 220μ/25v
L5 108μH
C22 0.1μ/50v
14.4
+12V
0V
14.4
R17 56K
R18 1K 0.3W
R21
IC1
2SC945Q
Q5
Q6
13.8
2.5
R23 1K
R24 1K
R26 1K
CR11 TLR106
2SC945Q
R19 1.8K
2.3
R20 100
R22 1K
CR10 RD5.1-EB2
R18
12V ADJ.

4.2 AC POWER PACK CIRCUIT BOARD

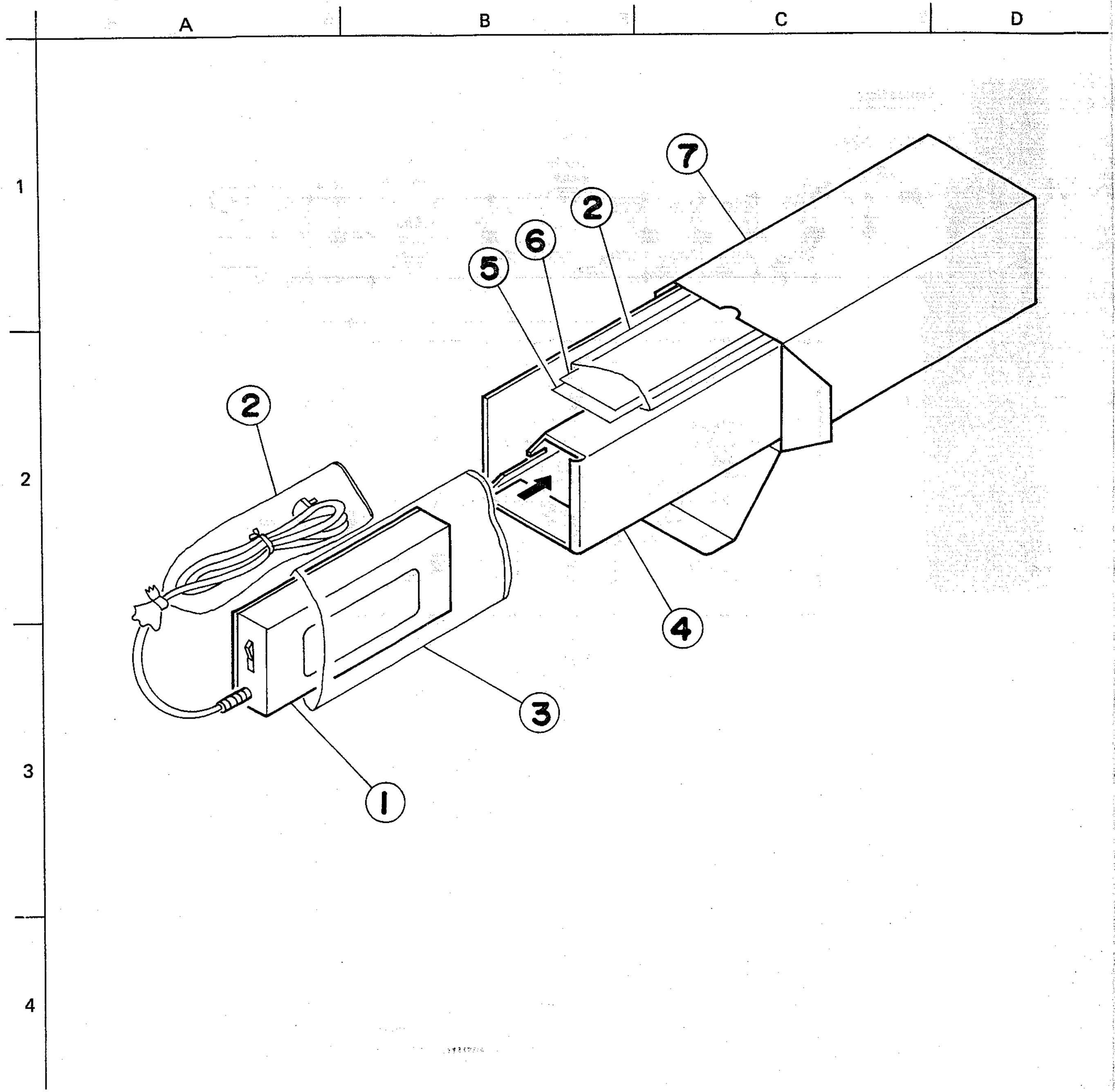

AC120V 50/60Hz
R1
C3
C2
F1
CR11
R26
C11
CR1
C9
C6
C5
L1
C1
AC-L
SW1
AC-N
Q3
Q2
R13
C16
R6
R11
R10
R16
R25
R14
C10
R4
R12
CR6
CR5
CR8
CR3 ORG
C4
IC1
Q6
R24
R21
R18
Q1
R5
R9
WHT
C15
BLU
C13
C14
RED
J1
J2
BRN
BLK
WHT
R23
R17
R8
CR2
R2
Q4
CR10
R22
R19
C22
C12
R3
L3
YEL
L2
BRN
T1
CR9
C17
C19
R20
Q5
L4
C18
C20
C21
L5

NOTE: Unless otherwise specified;

1. All resistance values are in ohms (1/4 W).
2. To measure voltages at T1 primary side, measure between blue (ground) and black indicated lines. At T1 secondary, measure between red (ground) and black indicated lines.

SECTION 5
EXPLODED VIEWS AND PARTS LIST

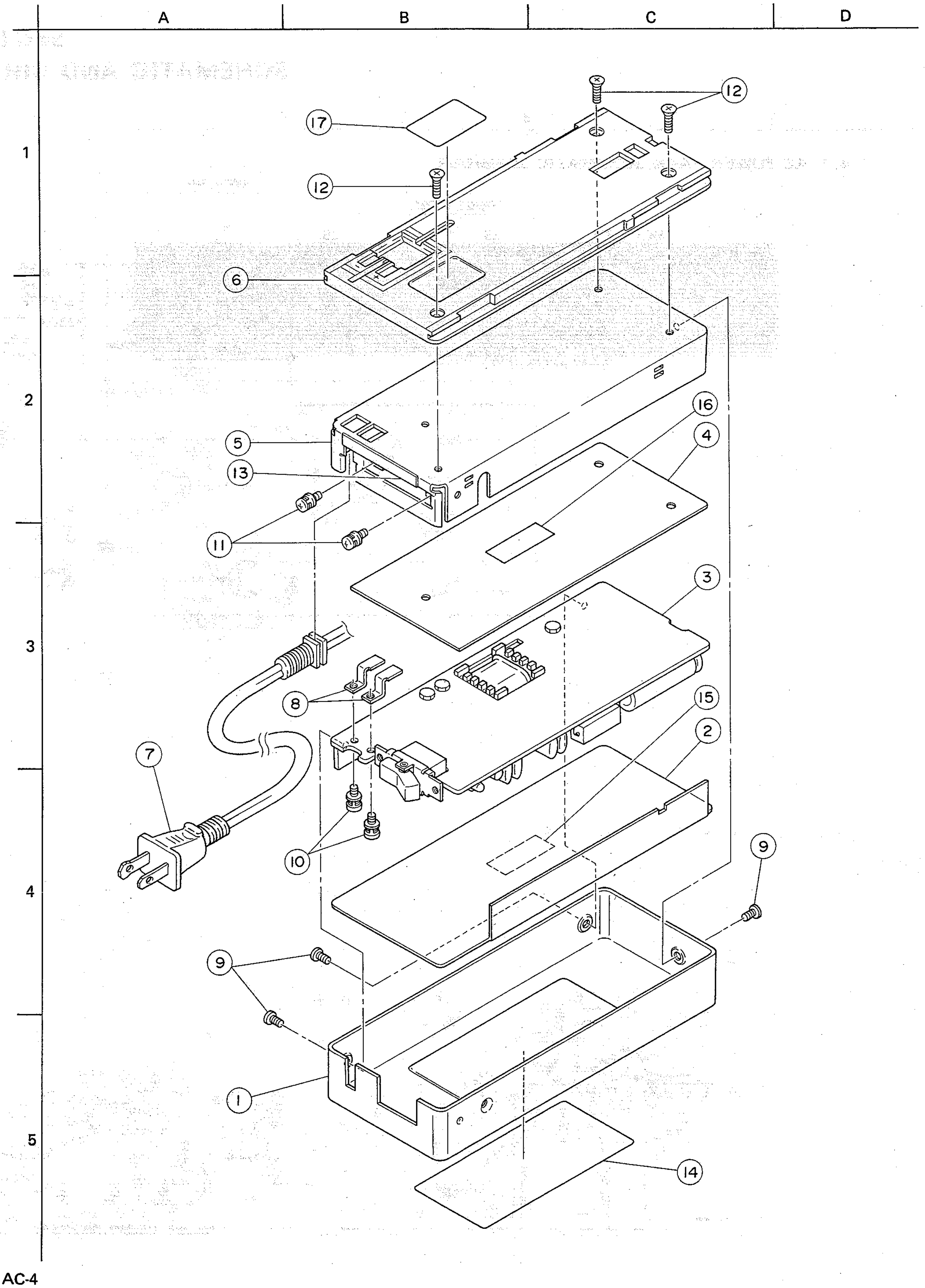
5.1 Packing assembly


A
B
C
D
1
2
3
4
⑦
②
⑥
⑤
②
④
③
①

– Packing assembly list –

Symbol No.	Part No.	Part Name	Description	Symbol No. Position	Q'ty
1		Power Supply Unit	AC-P3U	3-B	1
2	PU53217-026	Poly Bag		2-A	1
3	" -027	"		3-B	1
4	" -028	Packing		3-C	1
⚠ 5	PU30425-489	Instructions		1-B	1
6	PU30908-10-3	Warranty Card		1-B	1
7	PU53217-030	Packing Case		1-C	1

5.2 AC power pack assembly


A
B
C
D
1
2
3
4
5
⑰
⑫
⑫
⑥
⑯
④
⑤
⑬
⑪
③
⑧
⑮
②
⑦
⑩
⑨
⑨
①
⑭

SECTION 1
DISASSEMBLY

1.1 OUTER CASE

1. Remove five screws ⑤, grasp the front cover and take off the top cover. (Fig. 1-1)

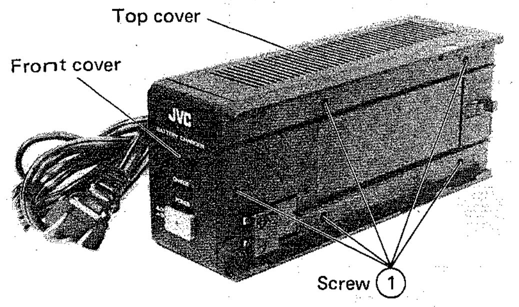


Fig. 1-1

2. Disengage connector ⓐ from the regulator board assembly and take out four screws ②. (Fig. 1-2)

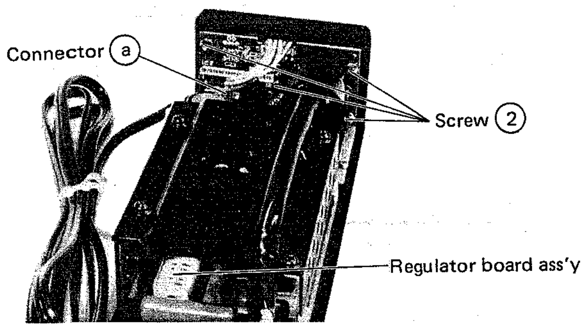


Fig. 1-2

3. Take out four screws ③ to remove the heat sink Ⓑ. Take out five screws ④ to remove the battery holder. Disengage the shorting plate from the plastic tabs (use care not to damage the tabs), then remove the terminal cover and terminal mount from the regulator board assembly.

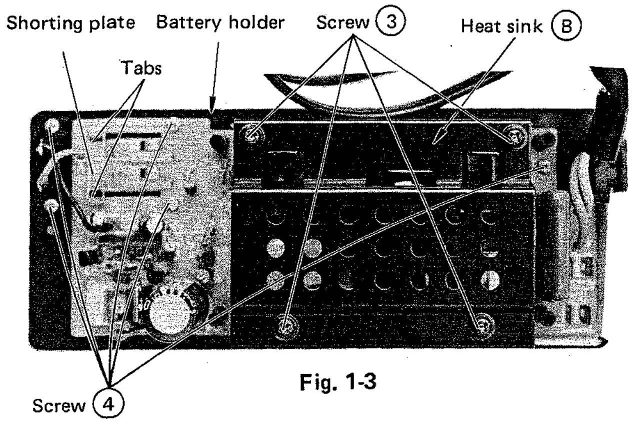


Fig. 1-3

SECTION 2
CIRCUIT DESCRIPTION

2.1 GENERAL

This battery charger is for exclusive use with the battery pack of the HR-C3 (NB-P3 and NB-P4). Either of these battery packs can be connected easily and quickly charged.
By use of converter plugs AC power source of 100–240 V can be applied.
The main features are: 1) quick charging by a constant current charging system, 2) over-charging is controlled by the peak detection system, 3) the built-in timer automatically decreases charging current after a certain time elapses. (Timer operates for 120 ± 20 minutes.)

2.2 VOLTAGE REGULATOR

The AC line voltage input is filtered and rectified, then applied to Q1 and the transformer, where it is converted into approximately 30 kHz AC. IC3 responds to input AC variations by controlling the Q1 oscillation pulse width.

At the secondary side, the output voltage is controlled by the charge stored in C14. Consequently, with peak-to-peak (p-p) variation of the input AC, by varying the pulse width, the C14 charge functions to stabilize the variation.

A photocoupler (PHC) monitors load variations and IC3 controls the output accordingly.

2.3 QUICK CHARGING CONTROL

Generally, charging of a sealed type nickel-cadmiun (NiCd) battery is performed using a low current over a period of 14 to 16 hours. This method is the most reliable for avoiding risk of damage or deterioration due to overcharging.

Quick charging, however, requires a rather high current. Therefore, a means is needed to detect and control the final stage of charging.

The employed method utilizes the property of the battery pack under quick charge of reaching a maximum voltage (Vp), then experiencing a voltage drop (see Fig. 2-1).

Battery voltage is detected at pins 1 and 12 of IC2. At the peak voltage (Vp), high potential appears at pin 2. This switches Q9 off, and Q8, Q7 and Q6 off. The charging loop then goes through R18, thereby reducing the charging current to 1/10th.

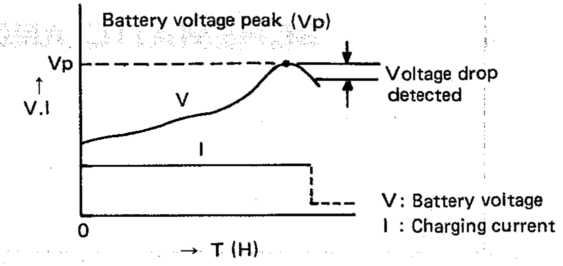


Fig. 2-1

2.4 TIMER CONTROL

This charging control system is independent of the above described peak detection method.

The internal timer of IC1 begins operation with the start of charging. After 120 ± 20 minutes elapse, low potential appears at IC1 output pins 2 and 6, thereby changing the charging loop to a low current, in the same manner as quick charge.

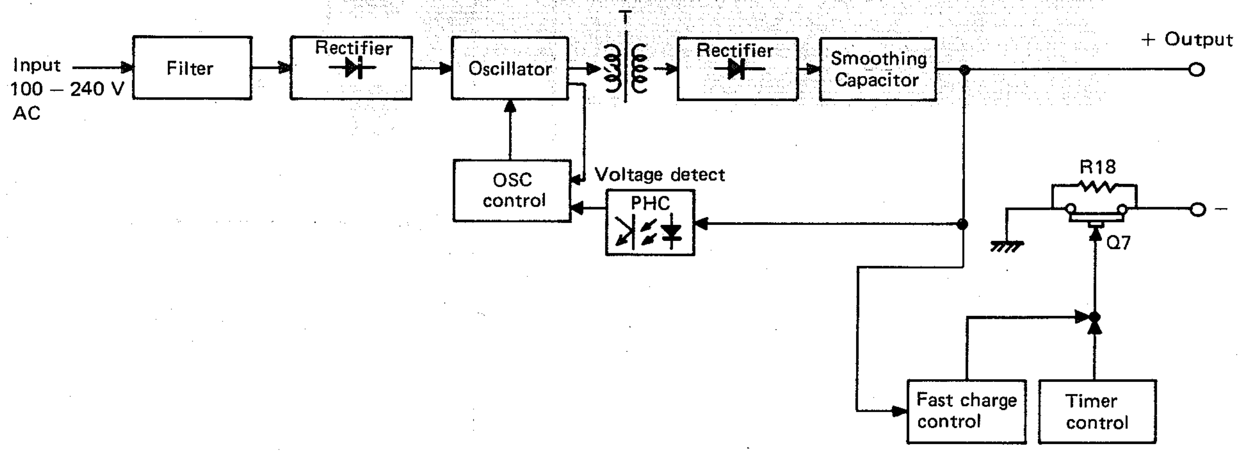
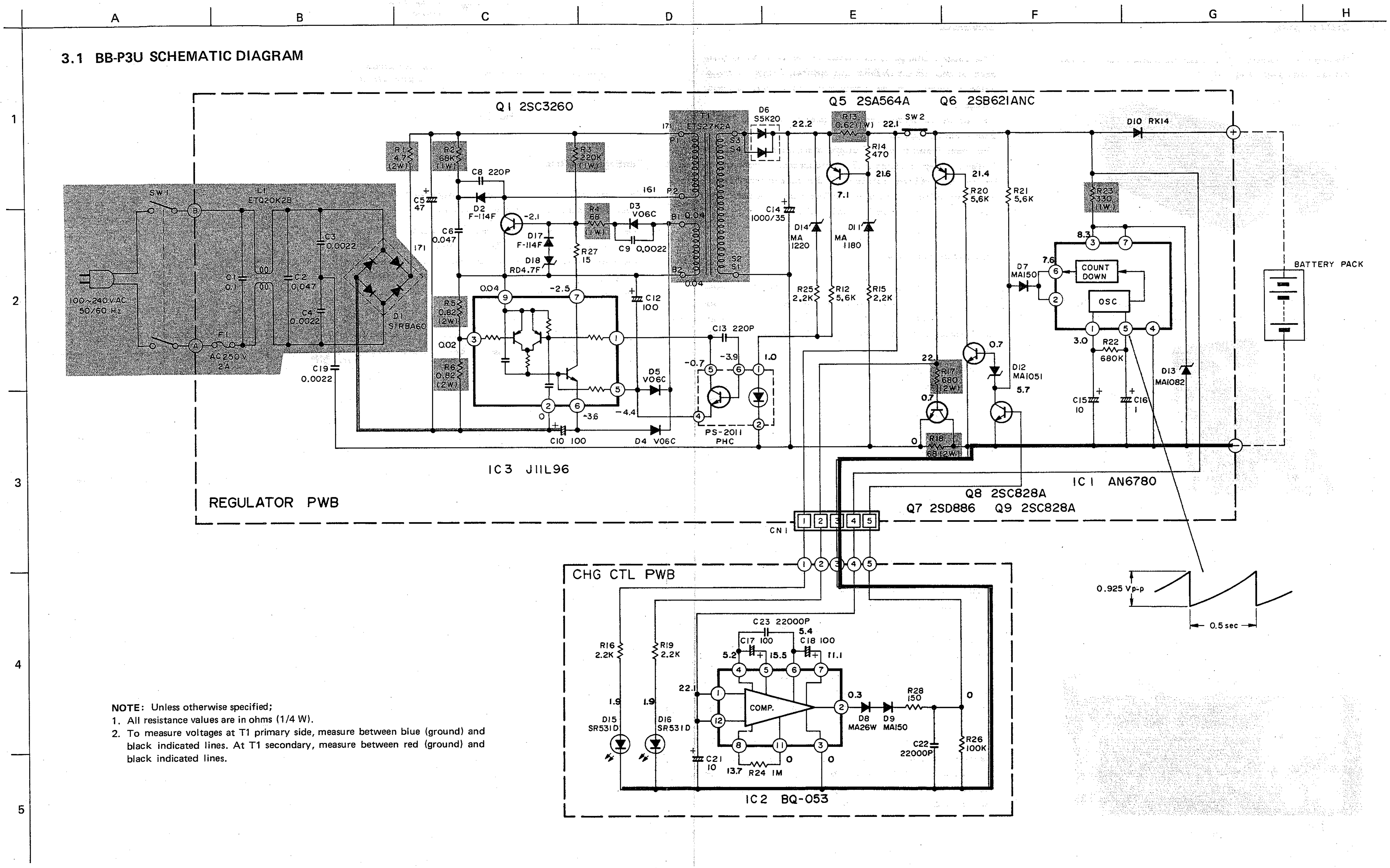


Fig. 2-2 BB-P3U Block diagram

SECTION 3
SCHEMATIC AND CIRCUIT BOARD DIAGRAM

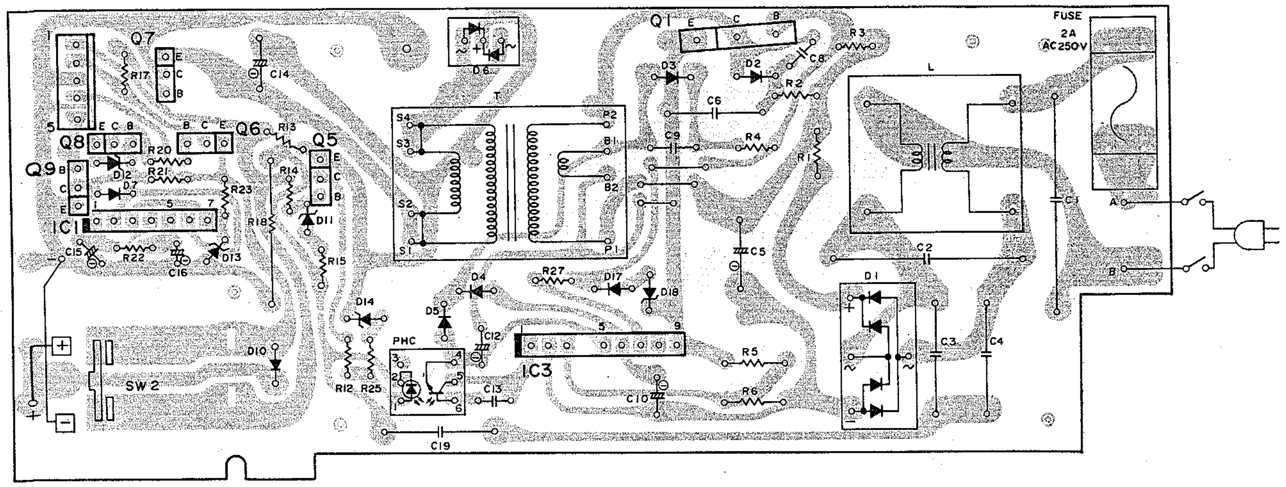
3.1 BB-P3U SCHEMATIC DIAGRAM


A
B
C
D
E
F
G
H
1
2
3
4
5
Q1 2SC3260
Q5 2SA564A
Q6 2SB621ANC
T1 ETS27K2A
D6 S5K20
R13 0.62(1W)
SW2
D10 RK14
R1 4.7 (2W)
R2 68K (1W)
R3 220K (1W)
C8 220P
C5 47
D2 F-114F
C6 0.047
R4 68 (1W)
D3 V06C
C9 0.0022
D17 F-114F
D18 RD4.7F
R27 15
C14 1000/35
R14 470
D14 MA1220
D11 MA1180
R20 5.6K
R21 5.6K
R23 330 (1W)
SW1
L1 ETQ20K2B
C1 0.1
C2 0.047
C3 0.0022
C4 0.0022
F1 AC250V 2A
D1 S1RBA60
100~240VAC 50/60 Hz
R5 0.82 (2W)
R6 0.82 (2W)
C19 0.0022
C12 100
C13 220P
D5 V06C
D4 V06C
C10 100
PS-2011 PHC
R25 2.2K
R12 5.6K
R15 2.2K
R17 680 (1/2W)
R18 68 (1/2W)
D7 MA150
D12 MA1051
COUNT DOWN
OSC
R22 680K
C15 10
C16 1
D13 MA1082
BATTERY PACK
IC3 J11L96
IC1 AN6780
Q8 2SC828A
Q7 2SD886
Q9 2SC828A
REGULATOR PWB
CN1
CHG CTL PWB
R16 2.2K
R19 2.2K
D15 SR531D
D16 SR531D
C23 22000P
C17 100
C18 100
COMP.
D8 MA26W
D9 MA150
R28 150
C22 22000P
R26 100K
C21 10
R24 1M
IC2 BQ-053
0.925 Vp-p
0.5 sec

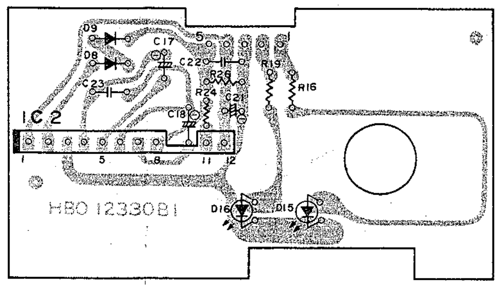
NOTE: Unless otherwise specified;

1. All resistance values are in ohms (1/4 W).
2. To measure voltages at T1 primary side, measure between blue (ground) and black indicated lines. At T1 secondary, measure between red (ground) and black indicated lines.

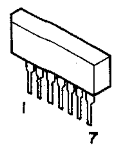
3.2 REGULATOR CIRCUIT BOARD


Q7
Q1
Q8
Q9
Q6
Q5
IC1
IC3
PHC
SW 2
FUSE
2A
AC250V
L
D1
R3
R2
R4
R5
R6
R27
C2
C3
C4
C5
C6
C10
C12
C13
C14
C19
D2
D3
D4
D5
D6
D10
D14
D17
D18
R12
R25

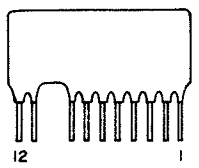
3.3 CHARGING CONTROL CIRCUIT BOARD


IC2
D9
D8
C17
C22
C23
R19
R16
R26
R24
C18
C21
D16
D15
HB0 1233081

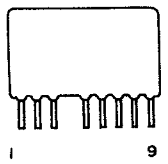
IC1 : AN6780



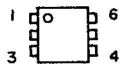
IC2 : BQ-053



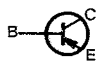
IC3 : J11L96



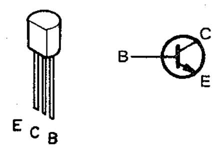
PHC : PS-2011



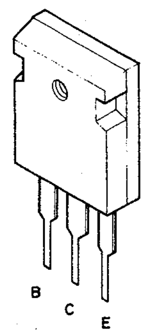
Q5 : 2SA564AQ
Q6 : 2SB621AQ



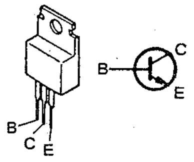
Q8, Q9 : 2SC828AP



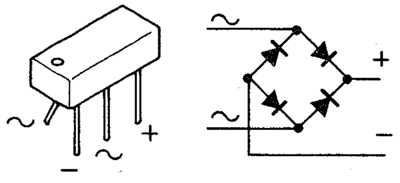
Q1 : 2SC3260



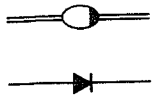
Q7 : 2SD886P



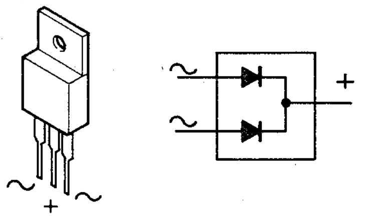
D1 : SIRBA 60



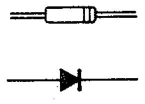
D3, D4, D5 : V06C
D2, D17 : F114-F



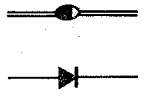
D6 : S5KC20



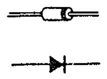
D7, D9 : MA150



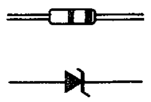
D8 : MA26W



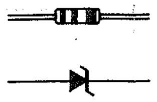
D10 : RK14



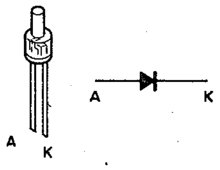
D11 : MA1200
D14 : MA1240



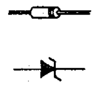
D12 : MA1051
D13 : MA1082



D15, D16 : SR531D

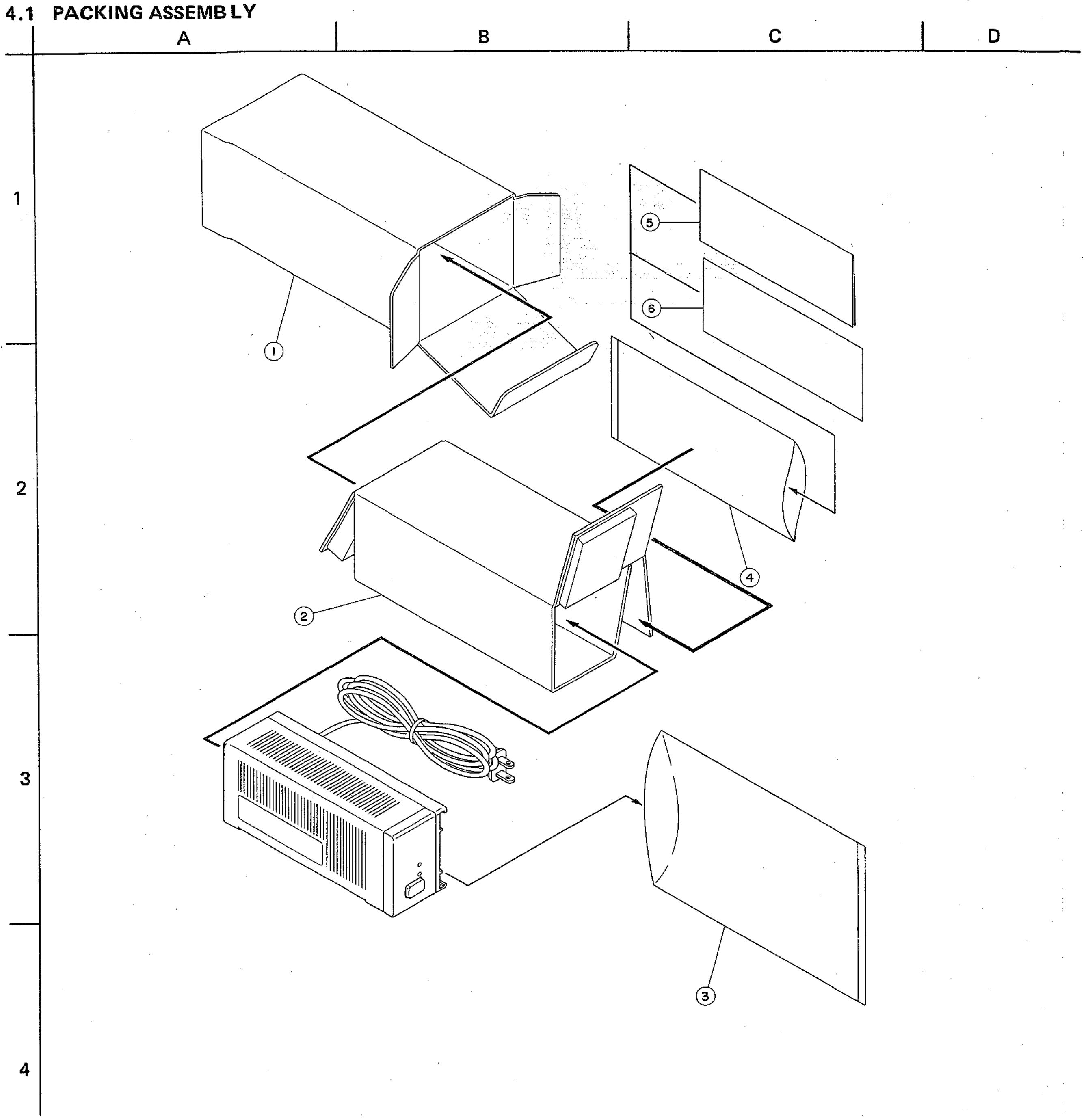


D18 : RD4.7F



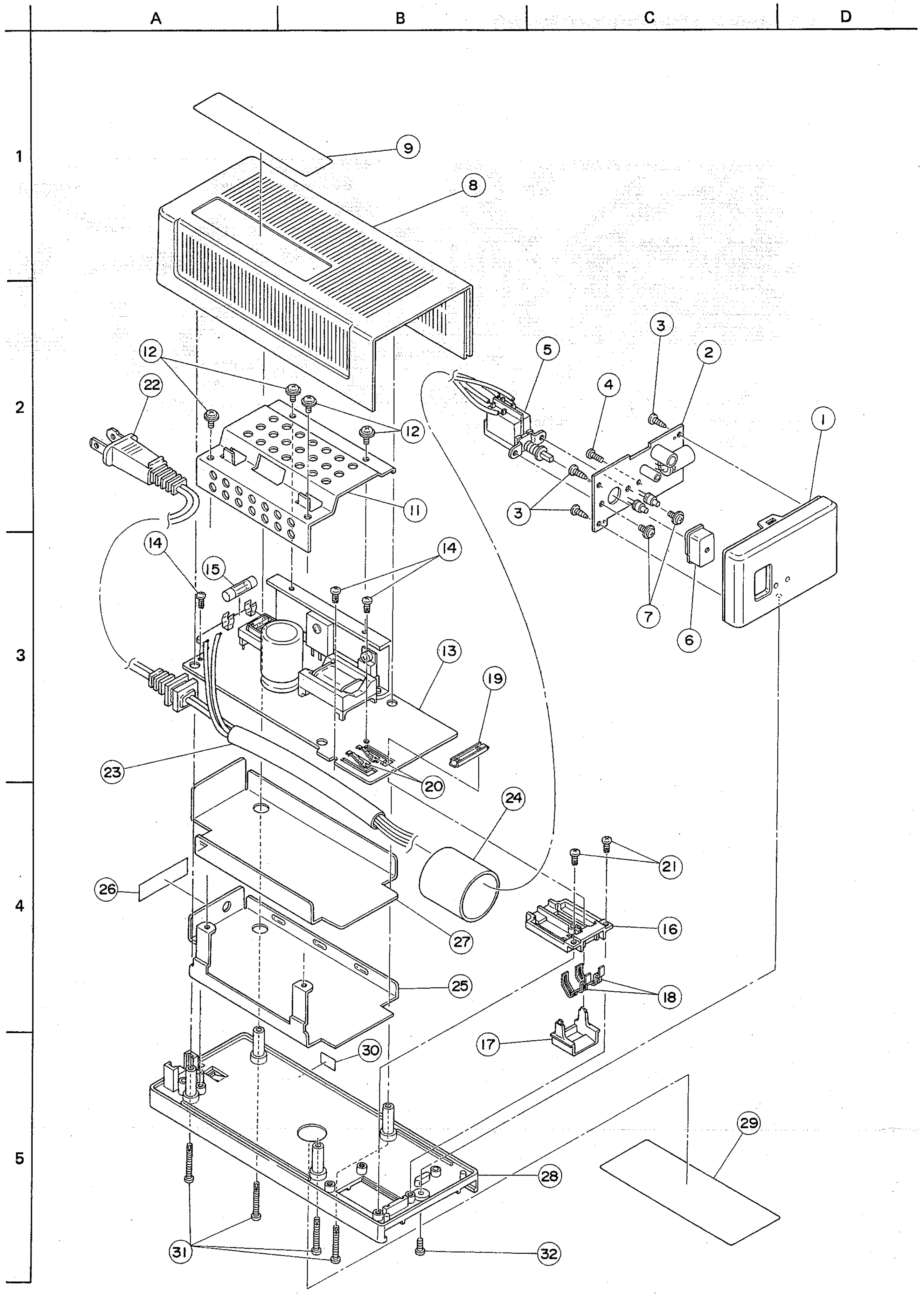
SECTION 4
EXPLODED VIEWS AND PARTS LIST

4.1 PACKING ASSEMBLY


A
B
C
D
1
2
3
4
①
②
③
④
⑤
⑥

Symbol No.	Part No.	Part Name	Description	Symbol No. Position	Q'ty
1	PU53200-351	Packing Case		2-A	1
2	PU53200-302	Packing		2-A	1
3	PU53200-303	Poly Bag A		4-C	1
4	PU53200-305	Poly Bag C		2-C	1
⚠ 5	PU30425-488	Instructions		1-C	1
6	PU30908-10	Warranty Card		1-C	1

4.2 BATTERY CHARGER ASSEMBLY


A
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C
D
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3
4
5
⑨
⑧
⑫
㉒
⑫
③
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②
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㉜

SECTION 1
MECHANICAL ADJUSTMENT

1.1 MAIN ASSEMBLY REPLACEMENT

1.1.1 Handling precautions

1. Take-up guide pole lever assembly ④, supply guide pole assembly ⑪ and gear unit assembly ㉘ are very critical parts. Be extremely cautions when handling them.
2. Do not disassemble the gear unit assembly ㉘.

1.1.2 Removing the bottom plate assembly

1. Remove the nine screws ㉝ from the bottom.
2. To remove the bottom plate, lift it upwards.

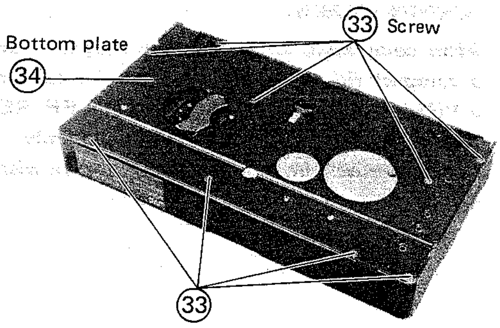


Fig. 1-1

1.1.3 Take-up guide pole lever assembly ④

1. With guide poles in the UNLOADING position, remove screws ⑤ and ⑨.
2. To remove the take-up guide pole lever assembly, first remove "E" washer ⑩ and then remove the spring from Ⓑ.

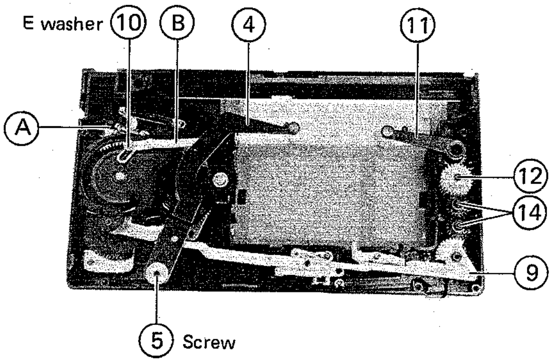


Fig. 1-2

3. To reassemble, attach the spring to Ⓑ and then follow the steps above in reverse.

1.1.4 Supply guide pole lever assembly ⑪ and clutch gear assembly ⑫

1. To remove the supply guide pole lever assembly ⑪, lift it upwards.
   To remove the clutch gear assembly ⑫, remove the T spring ⑬ and lift upwards.
2. To attach the clutch gear assembly ⑫, make sure the take-up guide pole lever assembly ④ is in the UNLOADING position. To bring the stud to which the T spring ⑬ is to be attached to the position shown in Fig. 1-3, mesh the clutch gear assembly with the idler gears ⑭. After having installed the supply guide pole lever assembly ⑪, attach the T spring ⑬ to the stud.
3. To install the supply guide pole lever assembly ⑪ properly, the take-up guide pole ④ must be in the UNLOADING position.
   Hold the supply guide pole lever assembly ⑪ so that its edge Ⓒ is parallel to the lid ② and engage it with the clutch gear assembly ⑫.
4. Before attaching T spring ⑬ to the stud on the clutch gear assembly ⑫, check to see whether the supply guide pole has a play of 5–10 mm. If there is not, shift the engagement of supply guide pole lever assembly ⑪ and clutch gear assembly ⑫ by one tooth.

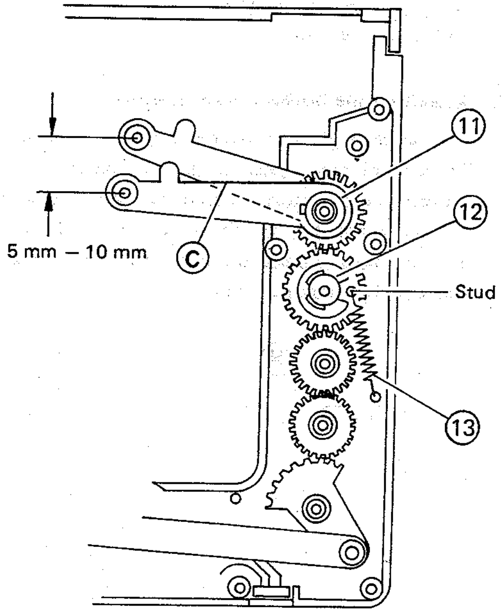


Fig. 1-3

1.1.5 Gear unit assembly ㉘

1. Remove the take-up guide pole lever assembly ④.
2. Remove the torsion spring ③ and rod from the stud of the lid ② and remove the four screws ㉙ .
3. While pushing the lock arm in the direction of the arrow, rotate the entire gear unit assembly clockwise and lift it upwards to remove it. When doing this, be careful not to bend the shaft of the first idler ㉖ .

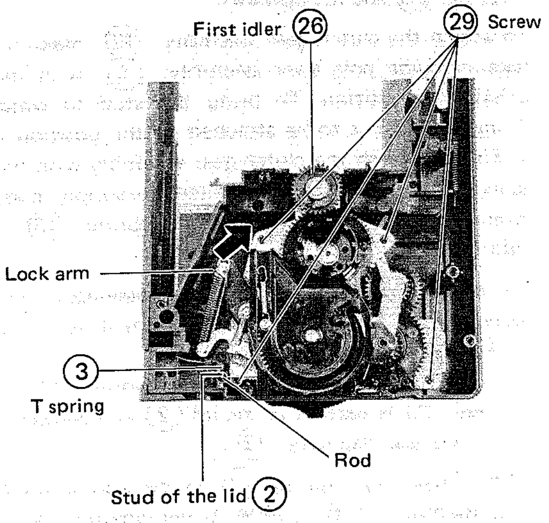


Fig. 1-4

4. To reassemble, perform the exact steps above in reverse; to prevent the rod from disengaging from the stud of lid ② , make sure the end of the torsion spring ③ lies on top of the rod.

1.1.6 Attaching the bottom plate assembly

1. The bottom plate is attached by the nine screws ㉝ . To prevent the supply guide pole lever ⑪ from being caught on the stud located on the reverse side of the bottom plate, tighten the nine screws while keeping the bottom plate pressed down firmly in the area of the stud and supply guide pole lever.

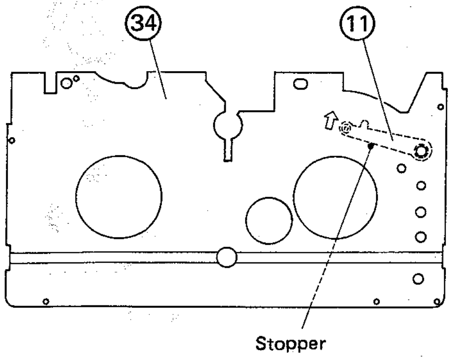


Fig. 1-5

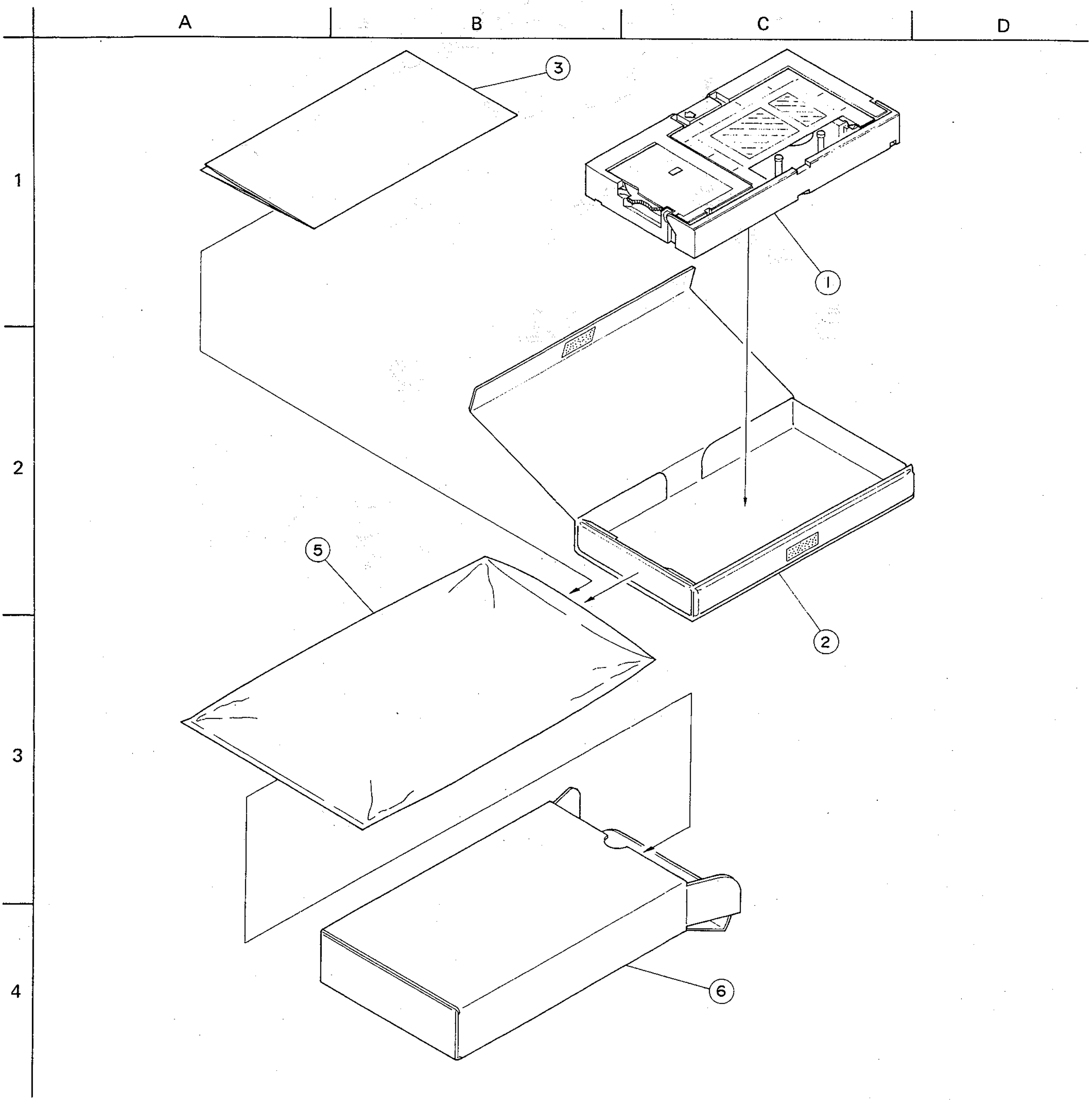
1.2 CHECK POINTS AFTER ASSEMBLING

1. Check the guide poles for perpendicularity.
   Without inserting a compact video cassette into the adapter, set the adapter to the LOADING position. Close the cassette door ㉟ and by pressing the cassette detect lever ㉑ , it can be set to the LOADING position. Open the lid ② and observe both the take-up and supply guide poles. Check that their boss and the upper flange are completely flush against the adapter frame.

   Note: Do not force the adapter into the LOADING position, without pressing the cassette detect lever ㉑ .
2. Check the operation of the take-up reel brake.
   Make sure that the take-up reel moves away from the brake pad when lid ② is opened and comes into contact with it when the lid is closed so that the brake functions properly.
3. **After completely assembling the adapter, actually load a compact video cassette, place the loaded adapter into a VHS recorder, operate the recorder's FF, REW, PLAY, SEARCH and PAUSE functions repeatedly, and check to see whether the tape is running stably without being damaged.**

SECTION 2
EXPLODED VIEWS AND PARTS LIST

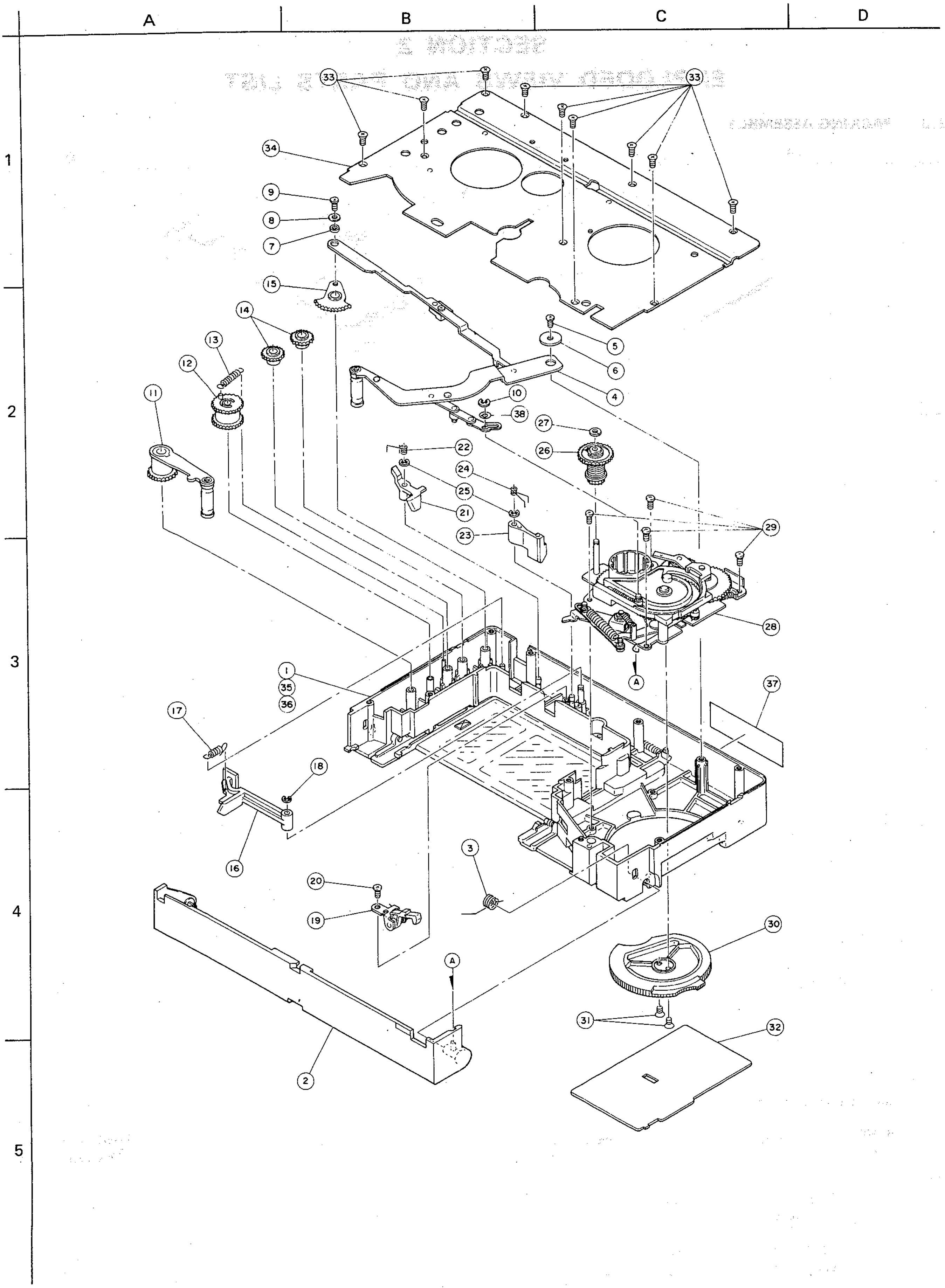
2.2 PACKING ASSEMBLY



— Packing assembly list —

Symbol No.	Part No.	Part Name	Description	Symbol No. Position	Q'ty
1	—	C-P2U		1-C	1
2	PU54470-2	Case		3-C	1
3	PU30425-515	Instractions		1-B	1
4	—	—		—	—
5	QPGA017-03005	Poly Bag		2-A	1
6	PU54170-5	Packing Case		4-C	1

.1 CASSETTE ADAPTER ASSEMBLY


A
B
C
D
1
2
3
4
5
33
33
34
9
8
7
15
14
13
12
11
5
6
4
10
38
27
26
22
24
25
21
23
29
28
A
1
35
36
37
17
18
16
3
20
19
A
30
31
32
2

— Cassette adapter assembly list —

Symbol No.	Part No.	Part Name	Description	Symbol No. Position	Q'ty
1	PU21424A	Adapter Frame Ass'y	Incl. ㉟ , ㊱	3-B	1
2	PU33666	Lid		5-B	1
3	PU53800	Torsion Spring		4-B	1
4	PU33663	Take-up Guide Pole Lever Ass'y		2-C	1
5	SPSK2004M	Screw		2-C	1
6	Q03091-150	Washer		2-C	1
7	PUM30005-21	Collar		1-A	1
8	WNB2000	Washer		1-A	1
9	SPSK2004M	Screw		1-A	1
10	REE2000	E. Washer		2-B	1
11	PU53734A	Supply Guide Pole Lever Ass'y		2-A	1
12	PU53741A	Clutch Gear Ass'y		2-A	1
13	PU54831	T. Spring		2-A	1
14	PU53746	Idler Gear		2-A	2
15	PU53747	Connect Gear		2-A	1
16	PU53756	Rec. Lever		4-A	1
17	PUM30001-101	T. Spring		3-A	1
18	REE1500	E. Washer		4-B	1
19	PU53754A	Bracket Ass'y		4-B	1
20	SPSK2004M	Screw		4-B	1
21	PU53750	Cassette Detect Lever		2-B	1
22	PU53751	Torsion Spring		2-B	1
23	PU53752	Stopper		3-B	1
24	PU53753	Torsion Spring		2-B	1
25	REE1500	E. Washer		2-B	2
26	PU53793A	First Idler Ass'y		2-C	1
27	PUM30017-1	Slit Washer		2-C	1
28	PU54976A	Gear Unit Ass'y	Incl. ㉖ , ㉗	3-C	1
29	SPSK2004M	Screw		2-C	4
30	PU54977A	Operation Knob Ass'y		4-C	1
31	SSSP2003M	Screw		4-C	2
32	PU53802-2	Instruction Plate		4-C	1
33	SSSP2005M	Screw		1-B, 1-C	9
34	PU33668A	Bottom Plate Ass'y		1-A	1
35	PU55004	Cassette Door Ass'y		3-B	1
36	PU53801	Torsion Spring		3-B	1
37	PU54116-5	Serial No. Plate		3-C	1
38	WSS2600Z	Spacer		2-B	1